Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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Commercial Fisheries Abstracts

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Bureau of Commercial Fisheries

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0 General and theoretical	3 Preserved fish	7 Analytical Methods
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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.32 STUDIES ON THE PROTEIN OF FISH SKELETAL MUSCLE
4. ULTRACENTRIFUGAL ANALYSIS OF CODLING EXTRACTS

Connell, J. J. (Torry Research Station, Aberdeen, Scotland)
The Biochemical Journal 69, 5-12 (May 1958)

Purpose.--This study was made to supplement the electrophoretic data previously obtained from an analysis of codling extracts made by the author in 1953. The author believes that this data will explain the existence in fish extracts of a protein corresponding in its sedimentation behavior to that of rabbit myosin. In the present study, the author measured and compared (1) the electrophoretic and the ultracentrifugal diagrams of codling extracts of increasing ionic concentration, (2) the amount of protein extracted, and (3) the actin-combining power of the extracts to learn when myosin, actomyosin, or both were being extracted.

Experimental.--In these studies live cod (Gadus callarias), never more than about 40 centimeters in length, were used. Extractions were conducted as rapidly as possible at 0° F. The methods of electrophoresis and the method for determining viscosity used in these studies were those described and reported by Connell (1953 and 1954, respectively). Ultracentrifuging was carried out in a Spinco Model E ultracentrifuge at temperatures of from 0° to 5° F.

For extraction, the fish were stunned by a blow on the head, decapitated, skinned, and filleted. The fillets were coarsely minced and the mince was slowly stirred with a buffered extractant at various ratios of mince to extractant for periods of 5 minutes, 15 minutes, 7 hours, or 24 hours. The mixtures then were centrifuged at 10,000 times gravity for 10 to 15 minutes, and the supernatant solution was decanted. Solutions intended for electrophoretic examination were dialyzed for 2 days at 0° C. against the same buffer that was used for extraction.

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 ABSTRACTER: Martin Heerdt

0.321 MORPHOLOGICAL CHANGES OF PROTEINS AND EFFECTS OF OF DENATURATION

Gorbacheva, L. B.; Bresler, S. E.; and Frenkel, S. Ya. (A. N. Bakh Institute of Biochemistry, Moscow and Institute of High-Molecular Compounds Academy Science U.S.S.R., Leningrad)
Biochemistry (U.S.S.R.) 22, Nos. 1 and 3, 66-78 (January-April 1957) (English translation by Consultants Bureau, Inc., New York, N. Y.)

The relation has been determined between the type of morphological changes of the macromolecular structure of horse serum albumin, α-chymotrypsin upon denaturation to the protein structure and the specific properties of denaturing and stabilizing agents.

It has been shown that the serum albumin macromolecule is capable of reversible denaturation so long as its internal S-S bonds remain intact. Breaking of these bonds, accompanied by resulfurization, leads to irreversible denaturation and aggregation. In the presence of stabilizers rupture of S-S bonds is not accompanied by aggregation; however, the morphological changes which occur are irreversible, and at extreme pH values the protein behaves as a linear polyelectrolyte.

α-Chymotrypsin denaturation is of a markedly abrupt type. The absence of a disulfide framework facilitates both denaturation and restoration of the native structure upon removal of the denaturing agent, if the configurational changes are not accompanied by rupture of chemical bonds.

 Authors' summary

0.32 UREOGENESIS IN ELASMOBRANCHS

Baldwin, Ernest (Scripps Institution of Oceanography, La Jolla, California)
Nature 181, 1591-1592 (June 7, 1958)

Marine elasmobranchs contain approximately 2 to 2.5 percent of urea in their blood and tissues. Fresh water elasmobranchs contain only about 1 percent of urea. In mammals, the synthesis of urea involved a number of reactions that can be summarized conveniently as follows:

(1) $CO_2 + NH_3 \xrightarrow{ATP;\ Mg^{2+};\ carbamylglutamate}$ carbamylphosphate, (2) Carbamylphosphate + orinthine → citrulline, (3) Citrulline + aspartate → argininosuccinate, (4) Argininosuccinate → arginine, (5) Arginine → ornithine + urea. Reactions 1 and 2 can be studied in acetone powders prepared from well-washed suspensions of finely divided liver tissue. Reactions 3 and 4 can be studied in acetone powders prepared from unwashed suspensions of finely divided liver tissue.

Experimental methods.--Studies on the synthesis of urea in elasmobranch liver were based upon the rat-liver methods of Grisolia and Ratner (1955). The determination of urea and of citrulline was carried out by a modification of the method of Archibald (1945). Adenosine triphosphate is required in in reactions 1 and 3, but the enzymes concerned are inhibited by this compound. Inhibition of the enzymes was avoided by using only catalytic amounts of adenosine triphosphate backed up by an active glycolytic system such as phosphoglycerate in the presence of glycolytic enzymes prepared from elasmobranch muscle.

Experiment 1.--L-Citrulline and L-aspartate were incubated together with arginase, the glycolytic enzymes, phosphoglycerate, adenosine triphosphate, magnesium ions, and extracts of the appropriate acetone powder from elasmobranch liver. Incubation was carried out at 30° C. for a period

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 ABSTRACTER: Martin Heerdt

0.321 STUDIES ON THE NORTH SEA COD II. DEOXYRIBOSE NUCLEIC ACID IN THE MUSCULATURE

Love, R. M. (Torry Research Station, Aberdeen, Scotland)
Journal of the Science of Food and Agriculture 9, 199-203 (April 1958)

Purpose.--This paper describes a study of the deoxyribose nucleic acid (DNA) in the muscle of cod (Gadus callarias). DNA occurs in the nucleus of animal cells in a remarkably constant amount. In certain cases the DNA content may be used to assess the mitotic activity of the tissue since mitosis is preceded by synthesis of DNA. DNA increases noticeably in tissue that is regenerating after damage.

Experimental.--Cod for this study were caught in the North Sea within a 40-mile radius of Aberdeen, Scotland. The amount of DNA was measured by determining the phosphorus fraction of the DNA molecule after separating DNA from any constituents containing phosphorus and then ashing the DNA. The DNA molecule contains a base, a sugar named deoxypentose, and phosphorus.

Results with DNA in myotomes and myocommata.--Muscle sections that had been stained with haematoxylin and eosin revealed a much larger concentration of cell nuclei in the myocommata tissue than in the myotomes and a higher nucleic acid content in the myocommata tissue than in the myotomes. For example, a cod 34½ inches in length contained 0.564 milligrams (mg.) DNA phosphorus per 100 grams of tissue in the anterior myotomes as compared with 0.889 mg. DNA phosphorus per 100 grams of myocommata tissue from the same area.

As a means of identification, myotomes are numbered from the point of severance of the fillet from the head. Thirty consecutive median myotomes, numbered 3 to 33, in the left-hand fillet from

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 ABSTRACTER: Martin Heerdt

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of 30 minutes in phosphate buffer at pH 7.3 to 7.4. Urea was produced in every instance. Preformed urea corresponded to that part of the original liver-urea not removed by treatment with acetone.

Experiment 2. --Studies were carried out by omitting one after another of the reactants. From the results it appears that intermediate reactions 3 and 4 in elasmobranch liver are similar to intermediate reactions 3 and 4 in rat liver. Arginase clearly is not a limiting factor, whereas the slight synthesis that did occur when adenosine triphosphate was omitted suggests that the enzymes concerned were not inhibited.

Experiment 3. -- Carbamylphosphate was incubated with L-ornithine and extracts of the appropriate acetone powder from elasmobranch liver. Magnesium ions and phosphate also were present but adenosine triphosphate, which is required for this reaction, was omitted together with phosphoglycerate and the glycolytic enzymes. Transcarbamylation of ornithine occurred in every instance and typical yields of citrulline ranged from 166 to 255 μ molecules per gram of powder per hour. Citrulline was found only in the presence of carbamylphosphate or ornithine.

Experiment 4. -- The production of carbamylphosphate by reaction 1 requires carbon dioxide as bicarbonate, ammonium ions, magnesium ions, traces of adenosine triphosphate backed up by phosphoglycerate and the glycolytic enzymes, and carbamylglutamate or acetylglutamate as a catalyst. Ornithine was added during reaction 1 to react with any carbamylphosphate that might be produced and to yield citrulline. In no case was any detectable amount of citrulline produced even (1) with undialyzed and dialyzed preparation; (2) with acetyl- and carbamyl-glutamate; and (3) in the presence of versene, cysteine, and higher and lower concentrations of magnesium ions. Attempts to fractionate the enzymes by precipitation with ethanol or with ammonium sulphate and by freeze drying were unsuccessful.

Conclusions. --The authors suggest that the enzymes responsible for reaction 1 differ somewhat in their properties and possibly that one or more of these enzymes is soluble and is removed when the tissue is washed before precipitation with acetone. A possibility also exists that the enzyme concerned may not have developed a specificity that extends to carbamyl- or to acetyl-glutamate or that the enzyme might act upon unsubstituted glutamate or glutamine. These possibilities are being explored. Conclusive evidence has not been obtained to show that ureogenesis in the elasmobranch follows pathways other than those established in the rat.

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a 35-inch cod caught in April of 1955 and held after death for 20 hours on ice, were dissected out free from myocommata and assayed for DNA phosphorus. The pattern of DNA concentration in the different parts of the fillets was inversely related to the size of the muscle fibers. This pattern may be explained in the terms of the number of fibers contained in a unit volume of tissue. As the cod increased in size, DNA was no longer inversely proportional to the increase in the size of the fibers although DNA did decrease somewhat. This was apparently the result of DNA synthesis in the larger cod. The concentration of DNA in cod of constant size, stayed roughly constant over most of the year except for an increase in DNA concentration during the summer months.

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Results. --Extracts of codling muscle in solvents having a pH of 6.5 or 7.5 and having an ionic concentration of 0.05 to 0.50 were analyzed by electrophoresis and by ultracentrifugation, and the results were compared with previous data. The results obtained in this study indicate a difference in the extractability of protein that is soluble in solvents at an ionic concentration of 0.2 or less from the extractability of protein that is soluble in solvents at an ionic concentration greater than 0.2. Actomyosin is extractable from very fresh codling muscle at ionic concentrations of as low as 0.1 at pH 7.5, but it quickly becomes insoluble. Actomyosin cannot be extracted under the same conditions from codling muscle that has passed into rigor mortis. Mono-disperse myosin is present in extracts of codling muscle prepared at an ionic concentration of 0.3 or higher and at a pH of 6.5 and 7.5. Codling myosin is extremely labile, and it aggregates rapidly either on standing in the cold or during precipitation.

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0.38 CYTOCHROME SYSTEM IN OYSTER TISSUES

Kawai, Kiyozo (University of Kyoto, Japan)
Nature 181, 1468-1469 (May 24, 1958)

Introduction.--Studies with oyster tissue extracts have proved the presence of an oxidase very similar to the cytochrome oxidase of higher animals. Whether cytochrome functions as a terminal oxidase in the intact tissues of oysters is still obscure because cytochrome has not been observed spectroscopically. Jodrey and Wilbur (1955) suggested that the cytochrome system may not play a major part in the oxidative metabolism of the oyster mantle of Crassostrea virginica. Their reasoning was based on the fact that methylene blue at a molar concentration of 1.4×10^{-5} did not reverse the cyanide inhibition of the tissue.

Present Study.--Faint absorption bands of cytochromes were observed in the tissue homogenate of the oyster, Crassostrea gigas, when this homogenate was reduced with hydrosulphite according to the liquid-air method of Keilin and Hartree (1949). A band corresponding to cytochrome A was observed only around 600 millimicrons (mμ) from the hydrolysates of the gill and of the mantle. A band corresponding to cytochrome B was observed at 560 to 565 mμ at room temperature and at 570 mμ at liquid-air temperature in the hydrolysate of the gill, mantle, adductor muscle, and digestive diverticula. Cytochrome C was not observed. All of the tissue extracts produced a strong pyridine haemochromogen band at 550 to 560 mμ.

Respiration of both the mantle and the gill was inhibited by about 50 percent when they were held in complete darkness in a mixture of 90 percent nitrogen and 10 percent oxygen. Inhibition of respiration was almost completely reversed by illumination with a 500-watt lamp. Respiration of both the mantle and the gill also was reduced to about 18 percent of the control value by 0.001 molar cyanide.

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ABSTRACTER: Martin Heerdt

2.118 THE FACTORY SHIP OF THE FUTURE

Birkhoff, C.
Hansa 94, No. 12/13, p. 583 (March 23, 1957) (Hamburg, W. Germany) (In German)
World Fisheries Abstracts 9, 13-14 (May-June 1958)

Four types of factory vessels should be distinguished: (1) mother factory ships of low speed (up to 12 knots) and between 100 to 160 m. (328 to 525 ft.) long, of which the whole 'tweendeck is equipped as a factory deck; (2) factory trawlers with low speed (12.5 knots) and between 70 and 80 m. (229.6 and 262.5 ft.) long, of which the stern "'tweendeck takes up the processing plant;" (3) factory trawler (stern trawler) with greater speed (over 14 knots) for landing fresh fish also equipped with a smaller processing plant; and (4) the conventional side-trawler, processing part of the catch. Rough weather often prevails on the fishing grounds of the German fishery. Up to now this has prevented the development of nonfishing factory vessels, as taking over the catch from the trawler to the factory vessel presented many difficulties. The trend, however, is more and more to build nonfishing factory vessels, which appear to be more profitable as compared with the self-fishing and processing vessel, owing to the better utilization of the engine plant. A factory vessel of 110 to 140 m. (360.9 to 459.3 ft.) in length with a capacity of 5,000 tons would be ideal. The following possibilities exist for taking over the catch from the trawler to the factory vessel: removal by derricks, by containers running over winding tackles, by elevators, or by pipelines. All methods require a calm sea. Such favorable conditions, however, seldom prevail in fishing areas. The use of detachable cod end with a funnel is suggested. As usual, it is fished from the trawler, and the anterior part of the net is hauled aboard. The anterior net ends with a series of rings fastened to each mesh. An equal series of rings exists at the beginning of the funnel. The connection between the anterior part of the net and the funnel and cod end is made by drawing a rope alternately through the rings of the 2 net sections (see illustration, over). By removing the line, the cod end and funnel can be easily separated from

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ABSTRACTER: A. von Brandt

2.143 APPLICATION OF ELECTRIC CURRENT IN FISHING

Meyer-Waarden, P. F.
Electrical Fishing, FAO Fisheries Study No. 7, Chapter 2, pp. 22-69 (1957)

Alternating, direct, and pulsating currents are used in electrical fishing. The first two types are used only in fresh-water fishing. Pulsating current is the key to commercial electrical fishing in sea water, and there are great possibilities in using it.

The present stage of technical development makes possible the manufacture of standard equipment that can be applied effectively in several ways. It is only necessary to adapt the fishing gear (electrodes, cables, and similar equipment) to the local requirements and to the species and size of fish to be caught.

Before buying electrical fishing equipment, it is necessary to know all details as to what type of fishing is to be done, the condition of the water and the bottom (conductivity, currents, etc.), and other local conditions.

According to the varying effect of the electrical current on the fish, a distinction must be made between fishing gear with (a) attracting anodic effect, (b) frightening or blocking effect, and (c) narcotizing or killing effect. All three groups are used in fresh-water and sea fishing.

Electrical gear with attracting anodic effect for fishing in fresh water.--Fishing gear, based upon the attracting anodic effect of the electric current, has been known in fresh-water fishing for many years. The first such gear operated with alternating current. Now in use is direct current that is taken from gasoline or diesel generators, as it was in earlier years, or is taken from batteries, as it has been more recently. Gear operating with direct current is used today in nearly all European countries and in many other countries.

Gasoline-generator gear consists of three parts: (1) gasoline generator with carrying frame; (2) control gear, including built-in cable rolls; and (3) catching electrodes designed as fishing

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ABSTRACTER: Kathryn L. Osterhaug

2.143 BASIC PRINCIPLES OF ELECTRICAL FISHING

Meyer-Waarden, P. F.
Electrical Fishing, FAO Fisheries Study No. 7, Chapter 1, pp. 1-21 (1957)

Techniques of electrical fishing have aroused great interest in many fishing countries during the last decade. Pulse currents, which have a considerably greater physiological effect on the living organism than have alternating and direct currents, and which have been used for a long time in human medicine--such as in electric shock therapy--were introduced into electrical fishing after the second world war by the German scientists Denzer and Kreutzer, thus increasing considerably the possibility of using electricity for fishing purposes. The method of electrical fishing, restricted until that time to fresh-water fisheries, could now be extended to sea fisheries. It was possible to design impulse generators driven by inboard engines, which for the first time affected, and even narcotized, marine fishes by means of electrical current.

Reaction of fish to direct current.--When direct current is passed into a fish tank, it can be observed that nearly all fish swim towards the anode, but before reaching it, they are usually stupefied and turn upside-down. When the current is switched off, they recover and swim away.

There are several phases of reaction with the gradually rising current-density. The first visible reaction of the fish is that--being in parallel position to the current direction--their bodies are vibrated by the current. If the fish are in transverse position to the current, however, they turn their heads towards the anode.

The second reaction occurs when the fish--if in parallel position to the current--swim towards the anode. If the fish are in a transverse position to the current, then the body-axes of the fish turn parallel to the direction of the current when the latter is turned on. The fish do not in all cases, however, swim towards the anode. That will occur only when a new pulse is given. The second reaction is called galvanotaxis.

The third reaction occurs when the fish turn on their sides, towards the anode, and are no longer able to move of their own accord. This reaction is called galvanonarcosis.

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ABSTRACTER: Kathryn L. Osterhaug

CYTOCHROME SYSTEM IN OYSTERS

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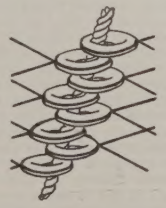
the trawl. If that is done, the net is closed and left floating near a buoy. To prevent the cod end with the fish from sinking or from drifting away for several hours until it is taken over by the factory vessel, it should be provided with a tube-shaped floating bladder of the same length (Abstracter's Note. This floating bladder has meanwhile proved to be superfluous). The marker buoy is located by a radar reflector and is taken aboard the factory trawler. In the meantime, the trawler combines her net with another funnel and cod end and is able to continue fishing operations undisturbed.



Connection between the anterior part of the net, funnel and cod end made by drawing a rope through alternate rings.

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Reaction of fish to alternating current. -- When alternating current is used, the fish do not swim towards one of the two electrodes, as they do in the case of direct and interrupted direct current, but they take a transverse position to the direction of the current between the two electrodes in such a way that they tap off a minimum voltage. This phenomenon is called oscillotaxis.

Moreover, most of the fish (for instance, trout, carp, tench, and catfish) undergo, according to Scheminzky (1941), a kind of "hypnosis" after the current is switched off. They do not return immediately to normal swimming position, but stay for some minutes in a lateral or dorsal position. When "hypnosis" vanishes, the fish swim away as they do in the case of direct current.

Reaction of the fish to interrupted current. -- When interrupted current is used, more or less heavy vibrations occur in the fish body, depending on the number of pulses used per time unit. As soon as the pulse-threshold for the electrotaxis is reached, the fish turns and swims towards the anode. This happens with all above-mentioned forms of pulsating currents except when the current is increased slowly and then decreased suddenly. In the latter case, the fish turn toward the cathode, and narcosis occurs in the same way as with direct current.

Owing to the conditions of conductivity in sea water, it is quite obvious that one cannot work with alternating and direct currents. According to investigations already made, it would be necessary to produce up to approximately 10,000 kilowatts to obtain an electrical fishing range=spherical range of a radius of only 10 meters. In such a case, it is only possible to operate with short pulses such as those of electric fishes. Only 200 to 300 kilowatts would then be required for the same effect.

Fish within a specific area remain stunned when they are affected by impulse rates that are above the threshold values required for narcotizing them. If the impulse rates are kept below the limit that narcotizes fish, however, the fish swim from a larger area towards the anode and, when they are close to it, become narcotized.

With a low pulse rate, the required electrical energy is reduced by half as compared with the effect of the purely stupefying method. This fact is of great importance to electrical fishing. It is possible to select the fish to be caught within a certain range by electricity according to size and kind because different species of fish react differently to varying pulse rates, and the threshold values of the pulse rates are known.

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Inhibition of respiration was reversed about 40 percent by a nearly saturated (6×10^{-5} molar) solution of methylene blue in sea water. A less saturated (1×10^{-5} molar) solution of methylene blue did not reverse cyanide inhibition.

Conclusions. --These studies indicate that the respiration of oyster tissues is dependent largely upon metabolic pathways that are involved in the system cytochrome--cytochrome oxidase. A cytochrome A band was observed only in some of the oyster tissues, whereas a cytochrome C band was not observed in any of the oyster tissues examined. Failure to observe these bands may be due to the low concentration of these substances.

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grates. The output of the gear amounts to 1.5 kilowatts. It supplies a direct current at a maximum of 350 volts and a load capacity of up to 10 amperes. A shunt regulator secures a continuous control of the working potential. Total weight: 85 to 87 kilograms (187½ to 192 pounds).

Electrical gear with attracting anodic effect for fishing at sea. --In the development of useful electrical fishing gear for fishing in small brooks and shallow fresh waters, many difficulties were encountered, but even more were met in the case of sea fishing. First, the greater conductivity of sea water as compared with fresh water had to be overcome by inboard equipment, and, second, the electrical fields and ranges had to be considerably larger. Electrical fishing gear for deep-sea fisheries is, of course, only of interest when it promises substantially increased catches.

The electro-technical solution of the problem was achieved by developing an impulse generator. A condenser that is loaded relatively slowly by a direct-current generator is discharged within a very short time over a throttle, and passes the concentrated energy over the electrodes into the water to obtain the high-peak voltages required. Adjustment of loading and discharging is done by means of an electronic governor, whereby the discharge current is switched over two parallel connected ignitrons.

To harness the energy employed for the production of pulsating currents in a practical way, it is necessary to achieve the required density of pulsating current within as large a range as possible without wasting too much energy in the direct vicinity of the electrodes. According to Haier, this can be accomplished by various measures: (1) by forming electrodes with largest possible surfaces, (2) by concentrating the potential at individual points or areas of the field and by giving the current a certain direction by means of auxiliary electrodes, and (3) by cumulating the current through short impulses for orientating the field.

These generators can be used in fresh water as well as in sea fisheries, but are not recommended for fresh-water fishing because their price and operating costs are very high. For sea fisheries, however, they should be very useful. Such a generator, for instance, can be used in the trawl fishery. Fish shoals can be concentrated before the net opening by means of the anodic effect, and paralysis prevents the fish from escaping the approaching net, providing the ratio between the current flow and interruption is correlated to the towing speed. In this way it should be possible to increase the catches.

2.40 SHOULD WE PREWRAP FRESH FILLETS IN CONSUMER PACKAGES?

Castell, C. H. (Fisheries Research Board of Canada, Technological Station, Halifax, Nova Scotia)
Canadian Fisherman 15, 12, 15 (June 1958)

Many discussions and even heated arguments concerning the most efficient way to wrap and hold fresh, unfrozen fish fillets have taken place among fish dealers. Arguments and opinions are, however, no substitute for facts.

One question that has caused considerable controversy is whether fresh fillets should be packed in direct contact with melting ice or protected from contact with the ice. Some tests were carried out at the Fishery Technological Station in Halifax, Nova Scotia, to help answer this question.

Experimental. -- Seventy 2-day-old market cod were filleted at the local fish plant. They yielded 140 fillets. One-half of these were individually wrapped in white onionskin paper and wrapped again in waxed wrapping paper. These double-wrapped fillets were placed 10 at a time in watertight aluminum containers. To ensure rapid initial chilling, these tins were left for 30 minutes with their lids open in a cool room at 10° F. At this time the fish had cooled to 32° F. but had not frozen. The lids were placed on the cans, and the cans were buried in chipped ice.

The other 70 fillets were placed, in groups of five, in 14 clean, wooden boxes. These boxes also contained a layer of chipped ice above and below the fillets. The boxes were constructed so that they were not watertight--melting ice water could trickle into the box from outside and could also trickle out of the box at the bottom. These also were buried in ice. After 3 days, 10 fillets from each lot were taken out for examination, and this procedure was repeated daily for 7 days. Examination of the fillets consisted in observing their odor, color, and texture. Then on each fillet, trimethylamine

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 ABSTRACTER: Kathryn L. Osterhaug

3.18 UP-TO-DATE SANITATION PROCESSES

Dixon, W. J. (Klenzade Products, Inc.)
Canner and Freezer 126, 18-20 (June 9, 1958)

In this world of highly developed methods of food processing, the battle for the consumer's dollar is being won by the processor who supplies the product that is most flavorable, appetizing, and tasteful and of highest quality. The discriminating shopper has an almost limitless choice of "convenience" foods, and the food processor cannot chance losing his hard-won position through the sale of inferior merchandise. He has to maintain top quality in his output.

Canning, because it deals with perishable food products that are subject to all sorts of contamination and deterioration by microorganisms, must be carried on with full knowledge and recognition of the importance of basic sanitation. Years of development and improvement have made it possible to produce and market a relatively safe canned product from the standpoint of public health and maintained quality. There are still occasions, however, where something goes wrong, and part of a pack, or an entire pack, is lost for the market.

Sanitation for top-quality products begins at point of production. The canner exercises great care in selecting the proper raw products at the very peak of production. Today's market for quality goods requires this procurement practice; it would be absurd for the canner to neglect basic sanitation during the processing. Top-quality products cannot be produced by machinery that is poorly designed and difficult to clean and maintain.

Corrosion-resistant metals. --Modern equipment should utilize metals that are corrosion resistant and that can be maintained up to the standard of original construction. The trend to more efficiency in plant design and to use of continuous operation procedures involving pipelines and flow-through equipment demands noncorrosive equipment.

Even modern plants that are laid out to achieve maximum volume in production cannot overlook basic sanitation provided by a comprehensive cleaning program. The detergent chemist has kept

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 ABSTRACTER: Kathryn L. Osterhaug

2.41 A NEW FISH BOX MADE OF PLASTIC

Anonymous
La revue de la conserve, p. 83 (March 1957) (In French)
World Fisheries Abstracts 9, 23-24 (May-June 1958)

Up to now, the solution to the problem of handling fragile fish has not been solved satisfactorily. The traditional wooden boxes or wicker baskets have defects which are well-known; besides, they can rot, are difficult to keep perfectly clean, and deteriorate rapidly.

The ideal solution seems to be to use plastic materials, but for many years no practical solution was found for the use of these products until the manufacture of the stratified polyester, which is a plastic reinforced with fiberglass.

A very carefully studied model measures: 500 mm. (19.7 in.) long, 400 mm. (15.7 in.) wide, and 70 to 100 mm. (2.8 to 3.9 in.) high. The walls have circular holes. The container is unsinkable and weighs 1 kg. (2.2 lb.) but the main advantages are its chemical inertia and the easy maintenance. This permits increased time-saving and reduces hand-labor, also protects the fish from mechanical damage. Sardines can now be piled on fishing boats and withstand not only the transportation but the first phases of handling in the cannery without being removed from the containers. These boxes can be piled one over the other forming rectilinear piles without pressing or bruising the fish. The chemical resistance of the plastic permits the keeping of the containers in saline solutions for long periods and the cleaning offers no problem. The polyester also resists the action of common detergents and disinfectants. It is also resistant to indentations and deformation.

 ABSTRACTER: Francisco Hoyos

3.2383 DESIGNING THE SEA FOOD PACKAGE

Birnie, James (Reynolds Metals Company)
Seafood Merchandising 18, 19-21 (February 1958)

Paramount considerations. -- Paramount factors in the design of fishery product packages are (1) preserving the quality built into the product by the food processor from the time it is packaged until it is consumed; (2) creating a quality to catch and hold the eye of the shopper who is exposed to thousands of food items clamoring for attention in supermarket aisles; and (3) providing the consumer with extra conveniences in preparing, serving, or otherwise using the item. With a few notable exceptions, fish packers have not kept pace with the industry in the latter two objectives.

Deficiencies. -- The most glaring deficiency in the design of fishery product packages is the failure to exploit shape and color, which are tremendous forces in enhancing appetite appeal, in strengthening product and brand identification, and in attracting consumer attention. Another deficiency is the slowness to endow these packages with "built-in" convenience. Others are (1) use of a package of standard design for various products, identified only by copy or label; (2) use of realistic illustrations of fishery products in their natural habitat, which often are repugnant, such as scaly, bulgy-eyed fish; (3) use of illustrations of fish prepared for serving that, although tantalizing, cannot be identified at a glance; (4) use of copy, illustrations, and emblems that are hard to read; and (5) absence of specific instructions, recipes, and specifications on how long the contents will keep without refrigeration.

Identification of product. -- Effective identification of the product includes illustration of fishery product as it appears ready for eating--golden brown crab cakes or white tender fish meat garnished with lemon, parsley, or butter and ready to melt in the mouth. More specific identification of

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 ABSTRACTER: June H. Olden

ICING FISH FILLETS

PLASTIC FISH BOXES

PLANT SANITATION

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product also is needed, such as a highly stylized shape or silhouette of the fish or shellfish. If an item of frozen food is meant to be cooked or reheated and enjoyed piping hot, the design of the package should be built around warm or hot colors to offset the fact that the product must be selected while frozen. The association of sea food and the sea with cool colors--blues, greens, whites, and grays--also should be taken into consideration.

Labeling. --Labeling of all six sides, alternating vertical and horizontal labeling, is recommended for maximum identification.

Directions and recipes. -- There is a trend toward more explicit directions and detailed recipes on packages.

Developments in packaging. -- In recent years, more and more packers of fishery products are exploiting the advantages of aluminum foil: printability, eye-catching glitter, and unique functional properties. One of the more important developments to come out of foil laboratories is the cook-in pouch, which offers maximum protection for the products, facilitates freezing and thawing, and provides the housewife with the maximum in convenience. Another development is a suitable method of vacuum-packaging frozen whole lobsters to obtain a storage life of 4 to 6 months. Tests show no significant difference in taste or flavor from those of fresh lobsters. Other developments are (1) a drawn-aluminum, single-seal square can for packaging smoked salmon and (2) a rectangular, rigid aluminum-foil container with instant-opening, tear-tape lid, soon expected to find applications in the frozen fishery products industry.

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(TMA) values were determined. Careful records also were kept of the temperature of the fillets at the time the boxes were first opened for examination.

Results. --The temperature of the fillets remained between 30° and 32° F. throughout the storage period. There was a very obvious difference in the spoilage rate of these two lots of fillets as judged by the appearance, off-odors, and TMA values. After the fifth day, there was no doubt in the minds of those examining the fish as to which group they would prefer to cook for dinner. There was no denying the fact that the fish that were protected against the leaching out of soluble nutrients and certain valuable flavor constituents also had gained some very offensive odors.

Round fish vs. fillet. -- At the same time that the fillets described above were being buried in ice, 70 gutted cod, similar to those from which the fillets had been cut, also were buried in chipped ice. After 3 days, 10 fish were removed from the ice and filleted. On each succeeding day, 10 more fish were removed and filleted. These fillets were examined and tested in the same way and at the same time as were the wrapped and unwrapped fillets that had been buried in ice.

The fillets "stored" in the whole fish were found to be quite similar to those that were wrapped and stored in waterproof containers. The only difference was that they did not go quite so bad during the last 2 days. The most reasonable explanation for this is that the spoilage in the whole fish takes place most rapidly in the gut cavity where the slowly running ice water cannot get at it.

Conclusions. -- In these particular sets of tests, it was observed that the fillets remained prefectly edible and reasonably fresh for the following periods: unwrapped in ice, 8 or 9 days; wrapped and stored in metal containers, 5 or 6 days; and stored as gutted fish, 6 or 7 days.

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pace with the equipment designer, and modern detergents are formulated not only to fully protect the more costly equipment but also to achieve maximum efficiency in line with the operating program laid out for the modern plant. No longer is reliance put upon old-time caustic, soda ash, trisodium phosphate or harsh, corrosive mineral acids. The modern detergent must do a complete job of loosening tough soil and removing it completely to render a physically and chemically clean surface. Often the cleaning procedure is accomplished without resorting to brushing, as in hand cleaning, and reliance must be put on the ability of the cleaner to remove soil by a combination of hydraulics and chemistry.

Adding chlorine to compound. --Recently, detergents in the alkaline field have been modified by the addition of a moderate amount of chlorine to enhance the cleanability of the compound and to increase its ability to solubilize and remove soil of a protein character frequently encountered in food-processing operations.

Chlorine-bearing products are not necessarily designed for bactericidal action, although they reduce the bacterial load in washing operations and are helpful in the effect on slime and mold growths. Large plants utilize more storage and holding tanks and larger processing vats that are not easily cleaned by hand methods. Here spray cleaning by recirculation methods is being employed to good advantage. The chlorine-bearing compounds have proved particularly satisfactory in these "in-place" cleaning and spray-cleaning procedures.

Cleaning by recirculation. --Cleaning of pipelines by recirculation has been carried on in other food fields, and the practicability of this procedure is established. Here again, design of equipment, construction, and installation are of paramount importance. Too often circuits are made up of dissimilar metals that enhance corrosion in the recirculation-cleaning process. Although inhibitors can be utilized in cleaners to some extent, nevertheless the transplanting of the baser metals occurs and corrosion is a major problem. It is essential that the complete circuit to be cleaned by "in-place" methods be constructed entirely of good stainless metal of the same type.

Pipelines should be installed to ensure tight joints that eliminate crevices in which food soil can be lodged. They should be installed with sufficient pitch for drainage to avoid pockets or sags where the cleaning solution is not allowed to drain away.

3.239 THAW RIGOR AND CELL RUPTURE

Love, R. M. and Haraldsson, S. B. (Torry Research Station, Aberdeen, Scotland)
Nature 181, 1334 (May 10, 1958)

In a recent communication, Marsh and Thompson demonstrated (1) that strips of sheep muscle frozen before the onset of rigor mortis could be shortened varying amounts by controlling the rate of thawing and (2) that if the muscle shortened by more than 50 percent of its original length much fluid exuded. At this stage, Marsh and Thompson concluded that the cell membranes had been ruptured by excessive contraction and that the muscle had entered what has been called the delta state.

To estimate cell damage by a chemical method, deoxyribonucleic acid phosphorus is assayed in the muscle press juice, and its concentration is considered to be proportional to the amount of sarcolemma rupture. When postrigor cod fillets are frozen and thawed, the amount of damage has been shown by this technique to be dependent on the velocity of freezing. Well-defined zones of cell damage have been observed at freezing times (times for the centers of the fillets to cool from 0° to -5° C.) of about 25, 80, and 200 to 500 minutes.

Cod fillets frozen before rigor, unexpectedly showed less cell damage at all rates of freezing than postrigor control cod fillets and no sign of damage with a freezing time of 80 minutes although the rates of freezing employed were in the range in which damage normally appeared. Damage was very noticeable in the postrigor controls. Both of the above groups of fillets were thawed in 5 hours at room temperature.

Another prerigor series of fillets that was wrapped in polyethylene film and thawed in water at 30° C. within 10 minutes gave very similar results to those obtained in the series discussed above. Deoxyribonucleic acid phosphorus values in the latter series ranged from 0.172 to 0.265 mgm. per 100 ml. expressible fluid.

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 ABSTRACTER: Martin Heerdt

3.335 CANNED FISH PRODUCTS

Anonymous
Konserves 15, No. 3, p. 32 (March 1957) (In Danish)
World Fisheries Abstracts 9, 39-40 (May-June 1958)

The article describes a membrane-free canned product of cod roe made by the Technological Laboratory of the Danish Ministry of Fisheries. Similar products are made in other countries. The procedure was as follows: the membrane was cut up and the roe mixed in a mixing machine. The membrane which did not twist round the stirring rod was removed by passing the mixture through a coarse sieve. In the process of stirring, 1% salt and 5% peanut oil were added to the membrane-free roe, which was then filled into cans, about 235 g. (8-5/16 oz.) in each, and processed for 75 min. at 115° C. (239° F.). After 3 and 7 months' storage at room temperature a taste panel found the product very good.

An antioxidant (a butylated hydroxyanisole composition), 0.05%, was added to one of the samples to counteract any possible rancidity, but no difference was found between the samples with or without antioxidant.

Samples to which had been added 0.2% monosodium glutamate were perhaps superior in the tasting tests after longer storage.

 ABSTRACTER: Poul Hansen

3.239 THE EXPRESSIBLE FLUID OF FISH FILLETS

Love, R. M. and Karsti, O. (Torry Research Station, Aberdeen, Scotland)
Journal of the Science of Food and Agriculture 9, 249-268 (May 1958)

VII. Freezing damage and protein denaturation under pressure.--Fillets of cod were frozen at different speeds under various pressures. The effects of pressure on cell damage during the freezing and on denaturation of the proteins during subsequent cold storage were studied and found to vary according to the experimental conditions. The effect of pressure, however, was less important than the effect of the rate of freezing, and in no cases were pressed fillets after storage inferior to unpressed fillets in 'eating' quality. It was concluded, therefore, that pressure during freezing was not harmful, but could be beneficial by accelerating the freezing through improved contact between the fillets and the cooling plates.

VIII. Cell damage in slow freezing.--The action of intercellular ice on muscle cells was studied by means of the deoxyribose nucleic acid method in fish fillets frozen at different speeds. It was found that the zone of minimum damage is achieved with a freezing time of about 115 minutes, which is the shortest time during which all of the ice is able to form in the intercellular spaces. Since the ice masses were relatively small, little larger than the muscle cells, they did not deform or damage the cells to any great extent. With slower freezing, cell damage was found to increase to a maximum value at 200 to 500 minutes, after which it decreased again. It was also found that in very slow freezing, the strong salt solutions created by the freezing out of water from the weakly saline interstitial fluids exercised considerable solvent effect on the fibers without actually breaking them open. The concentration of protein in the interstitial fluid, therefore, tended to increase during very slow freezing (freezing time about 750 minutes).

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 ABSTRACTER: Kathryn L. Osterhaug

3.5 STUDIES ON SALT FISH III. EQUILIBRIUM MOISTURE COEFFICIENTS OF SALT FISH MUSCLE

Cooper, D. LeB. (Atlantic Fisheries Experimental Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 4, No. 2, 136-140 (May-July 1938)

In an attempt to treat the drying of salt-fish muscle analytically, the author discovered that no data were available on the equilibrium relationship between the muscle system and the pressure of the water vapor in the ambient air. These equilibria are usually called equilibrium moisture coefficients of the material under treatment when drying is considered, or more generally the adsorption coefficients. The author determined these coefficients for fish muscle containing about 50 percent salt.

This study was carried out with a McBain-Bakr adsorption balance in combination with an arrangement that would give constant vapor pressures that could be varied at will between the required limits. The apparatus (figure 1 omitted) consisted of a water bath containing two adsorption tubes connected to a mercury manometer (M). Samples were suspended from quartz spirals hung from hooks on the inside of these bulbs. The apparatus was connected to a suitable vacuum system and a constant temperature bath (D, J) for controlling vapor pressure. Lengths of the quartz spirals and pressure differences on the manometer were read on a cathetometer.

All samples were cut from hard salt-fish containing approximately 50-percent salt. As a rule the samples were dried to constant weight in a vacuum, and the equilibrium moisture content was determined during the increase in weight. Six samples were treated at 15° C., 28 at 25° C., and 6 at 35° C. Table 1 and figure 2 (omitted) show that the equilibrium moisture (percentage, dry weight) values for all samples were the same at a given equilibrium moisture coefficient. This was

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 ABSTRACTER: Martin Heerdt

THAW RIGOR AND CELL RUPTURE

CELL DAMAGE FROM FREEZING

CANNED COD ROE

EQUILIBRIUM MOISTURE COEFFICIENTS

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IX. Other types of cell damage caused by freezing.--Cell damage that occurred during a freezing time of 25 minutes was investigated and found to be caused by the mechanical action of the expansion of ice crystals growing within the cell. Supercooling, followed by a sudden, rapid growth of ice crystals at the onset of freezing, did not cause undue damage to the cells. Evidence was presented to show that the expressed fluid of cod fillets originates near the cut surface only and does not come from the deeper layers.

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true irrespective of the nature of the sample or of changes in temperature. A definite hysteresis was observed at high equilibrium moisture coefficients. Below equilibrium moisture coefficients of 0.76, salt-fish muscle acts as a wetable surface for the adsorption of water vapor. Above 0.76, the regain and falling rate curve coincides, and the equilibrium values become indeterminant. It appears, therefore, that in the range 0.753 to 0.754, the system acts as a saturated solution of sodium chloride, and distillation occurs on the sample until the activity of the water in the sample becomes equal to that in the surroundings. Over saturated salt solutions, the equilibrium moisture coefficients remain constant, within the accuracy of these experiments, in the range 15° to 35° C.

Table 1.

Equilibrium moisture coefficient	Equilibrium moisture contents	
	Downward	Return
0.20	...	2.7
0.30	...	3.7
0.40	5.7	5.0
0.50	7.7	6.7
0.60	12.0	9.1
0.70	24 - 25.5	19.4
0.725	30 - 35	27.6
0.75	45	...

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Since whole fillets and not thin strips of muscle were used, it was not possible to thaw the fillets in less than 10 minutes without risking denaturation of the proteins. Consequently, the authors did not obtain shortenings as great as 50 percent, which is the minimum required for cell rupture. In the more slowly thawed series of fillets, the authors found no appreciable shortening; whereas in the series thawed in 10 minutes, shortening ranged from 4.5 to 21.4 percent. Although these results are not at variance with those of Marsh and Thompson, they do show that if prerigor muscle has not entered the delta state it is less subject to damage by ice than is postrigor muscle.

Histological sections of the frozen samples showed a tendency for the ice crystals in prerigor muscle to be smaller in size than those in postrigor muscle identically treated. The reason for this tendency is not known at present, but it may be connected with the difference in levels of intracellular inorganic phosphate from adenosine triphosphate under the two conditions.

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3.5 STUDIES ON SALT FISH IX. EFFECT OF ENVIRONMENT UPON GROWTH OF RED HALOPHILIC BACTERIA

Hess, Ernest (Atlantic Fisheries Experimental Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 6, No. 1, 10-16 (December 1942)

The author studied the temperature range, heat resistance, relative-humidity range, effect of ultraviolet light, and salt tolerance of 25 strains of red halophilic bacteria. The basic culture medium used was the modified skim-milk salt agar of Lochhead (1934) prepared by mixing equal parts of reheated sterile milk and liquified sterile salt agar. This medium contained 450 parts of sodium chloride and 50 parts of agar in 1,000 parts of tap water.

Nine different strains of red halophilic bacteria that were cultured on modified skim-milk, salt, and agar stopped growing if the temperature rose above 55° to 60° C. or fell below 10° to 15° C. One strain of red halophilic bacteria, which was suspended in a medium of skim milk containing 13.5 percent salt, survived for 2 minutes when subjected to a temperature of 99.4° C. The same strain survived 3 minutes exposure to 98.7° C. in 27 percent saline solution, and survived 8 minutes exposure to 86° C. in 27 percent saline solution.

The relative-humidity range for the growth of red halophilic bacteria lies within 70 to 85 percent relative humidity with an optimum at 75 to 80 percent. This range is practically independent of temperature and is fairly constant.

Exposure of red halophilic bacteria to ultraviolet light from a Westinghouse "Sterilamp" (2537 Å units) for 35 minutes at 10-cm. distance failed to sterilize either the salt or the salt fish. Plate cultures exposed for 60 minutes to ultraviolet light showed almost continuous growth over the surface

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 ABSTRACTER: Martin Heerdt

3.63 FUNDAMENTAL ASPECTS OF THE DEHYDRATION OF FOODSTUFFS ABSTRACTS FROM THE ABERDEEN CONFERENCE AT THE UNIVERSITY OF ABERDEEN, MARCH 25 TO 27, 1958

Jason, A. C. (Torry Research Station, Aberdeen, Scotland)
Food Manufacture 33, 206 (May 1, 1958)

A study of evaporation and diffusion processes in the drying of fish muscle. -- The rate of drying of fish muscle during the constant-rate period is controlled solely by the conditions of the ambient atmosphere and is equal to that from a saturated surface of the same shape. The duration of the constant-rate period is related to the rate of evaporation per unit area by an expression involving the effective diffusion constant, the thickness of the sample and the free water concentration as parameters.

Drying during the falling-rate period takes place in two distinct phases, in each of which the behavior is in accord with a solution of the diffusion equation based on Fick's Law. In each phase, drying is characterized by an effective diffusion coefficient which is independent of shrinkage of the muscle and which in the first phase is considerably greater than in the second phase. Both coefficients vary with temperature according to an Arrhenius type of equation in which the energy of activation for diffusion is one of the parameters. The transition from the first to the second phase appears to be associated with the uncovering of the unimolecular layer of water which covers the protein molecules. Experimental evidence suggests that the processes of evaporation and diffusion may be characterized by a scheme of energy levels involving the heat of adsorption of the unimolecular layer, the heat of liquefaction of water, and the energies of activation corresponding to each of the two phases of the falling-rate period.

All species of nonfatty fish exhibit identical drying behavior during both the constant-rate and

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3.5 DRYING OF HEAVILY SALTED FISH

Linton, E. P. and Wood, A. L. (Atlantic Fisheries Experimental Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 6, No. 5, 380-391 (October 1945)

This study had as its objective a determination of the optimum temperature, air velocity, and relative humidity for air drying heavily salted fish. The data accumulated has led to the successful use of artificial dryers during the past five years.

The drying rate of salt fish is constant for air velocities in excess of 100 cm. per second (200 ft. per minute) under optimum temperature and relative-humidity conditions. At velocities of less than 100 cm. per second, the rate of drying decreases perceptibly. Variation in dry-bulb temperature between 15.6° and 32.2° C. (60° and 90° F.) had little effect on the rate of drying. The optimum relative humidity for drying salt fish is 45 to 50 percent. Initial drying takes place at a constantly decreasing rate until after 6 to 10 hours when a definite change occurs. Subsequent drying follows at an almost constant rate.

Plots of data on cut samples indicate clearly that after 10 hours of drying a typical salt crust has formed on the surface and that air conditions then become the factor that controls further drying. Both on cut samples and on whole salt fish, the amount of surface exposed to the air stream is the most important factor when the fish are dried under optimum conditions. If the fish are dried at low air velocities or at high humidities, migration of the water to the surface of the fish may be a controlling factor, and the thickness of the sample will have an influence on the drying rate.

The salt crust formed on fish was found to consist largely of salt crystals mixed with a small amount of protein or of salt-free fish solids. A typical analysis of this crust showed 80 percent salt,

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 ABSTRACTER: Martin Heerdt

4.11 SEPARATION AND IDENTIFICATION OF HIGHER FATTY ACIDS BY PAPER CHROMATOGRAPHY

Alimova, E. K. and Volgova, G. D. (State Medical Institute, Rostov on Don, U.S.S.R.)
Biochemistry (U.S.S.R.) (English translation by Consultants Bureau, Inc., New York, N. Y.) 22, No. 3, 527-529 (May-June 1957)

Significant defects in the current method of chromatographic analysis of the higher fatty acids include the difficulties of detecting these fatty acids on chromatograms and of identifying the spots obtained. These difficulties are caused by the inadequate sensitivity of the reagents used for detection, the rapid disappearance of the color, and the variation in Rf values.

The method proposed here for detection of fatty acids by paper chromatography is simple, the color of the spots is stable, and the method of identification is fairly accurate.

Experimental procedure. --The fatty acid mixture is separated by a modification of Spitery's method (1954). Paper to be used for fatty acid chromatography is washed with 0.5 percent hydrochloric acid for 3 minutes and then washed six times with water, three times with ethyl alcohol, and five times with ether. The paper is dried until the odor of the ether disappears. Strips 37 centimeters long and from 0.5 to 5 centimeters wide are cut from this prepared paper. A line is ruled at a distance of 5 centimeters from the edge. Holes are cut at opposite ends of the wide strips, and the strips are threaded onto a glass rod that then is fixed in the upper part of a glass cylinder. A 10-percent solution of paraffin oil in benzene is poured into the bottom of the cylinder to impregnate the paper strips. When the solution has reached the required height, the strips are removed and dried in air. The chromatograms are developed by the ascending method with glacial acetic acid. After again being dried in air, the chromatograms are washed with distilled water and are treated with a silver

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 ABSTRACTER: Kathryn L. Osterhaug

RED HALOPHILIC BACTERIA

DRYING HEAVILY SALTED FISH

DRYING OF FISH MUSCLE

FATTY ACID CHROMATOGRAPHY

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10 percent protein, and 10 percent water. Subsurface layers showed a steady increase in water content down to depths of 2 mm., at which depth the salt-to-water ratio became constant, with the water in this portion being saturated with salt. Salt-and-water distribution experiments demonstrated clearly that the salt solution in fish moves to the surface along the muscle capillaries under the influence of surface tension. If water is removed slowly at low drying potentials by evaporation from the surface of the fish, the salt solution migrates along the capillaries through the salt crust at the surface and an ever increasing thickness of salt crust accumulates. Conversely, at high drying potentials, rapid evaporation occurs in or below the salt crust on the fish. As subsurface evaporation continues, the evaporation zone gradually retreats. Excessively low humidities, therefore, dry the salt-protein crust to such an extent that the water vapor is barely able to diffuse through this crust. The result is a slow rate of drying. Plotted data obtained from water-salt distribution experiments with cut samples of kench-cured cod showed a parabolic distribution of moisture during the first 6 to 10 hours of drying.

The drying rate was not influenced by air velocities above 100 cm. per second (200 ft. per minute) nor by a change in dry-bulb temperature. This information supports the theory that a salt crust is formed on the sample and that drying must consist of evaporation of the liquid water below this crust. Variations in relative humidity appeared to affect the equilibrium moisture content of the salt-crust surface and its permeability to water vapor. For this reason, changes in relative humidity do influence the drying rate.

Press piling of salt fish permitted the moisture and salt solution at the center of the pieces to migrate to the surface along the capillaries and rewet this surface with the salt solution. When these pieces were placed in the air stream, drying took place at a relatively rapid rate. This rate was similar to the rate of drying that occurs in salt fish just out of pickle.

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solution or with a bismuth nitrate solution.

The bismuth nitrate method is used to detect fatty acids with chain lengths in the range C_{12} to C_{24} both individually and in mixtures of up to three acids. The strips that have been treated as described above are covered for 10 to 15 minutes with basic bismuth nitrate solution (1 gram of bismuth is shaken with 100 milliliters of distilled water for 2 to 3 minutes, and the precipitate is filtered off after being allowed to settle for 2 hours). The solution is decanted off, and the strips are washed 10 to 12 times with small portions of distilled water and then are covered with amminium hydrosulfide (ammonia solution of specific gravity 0.968, saturated with hydrogen sulfide). The acids appear almost immediately as black spots on a gray background. The chromatograms are washed to remove the excess reagent and are dried in air.

Detection of the fatty acid spots by means of silver solution is accomplished by covering the developed chromatogram strips with 1 percent ammoniacal silver solution for 15 minutes. Excessive silver is removed by washing 10 to 12 times with distilled water. The strips then are passed through a 10 percent aqueous glucose solution, are partially dried in air, and are sprayed with 0.5 N alcoholic solution of caustic soda (saturated NaOH solution diluted with alcohol). After a period of time, yellow-brown spots appear on a white background with a faint cream tinge.

The sensitivity of both of these methods is dependent upon the width of the bands and the number of carbon atoms. The method in which bismuth salts are used is the more sensitive.

3.5 (Cross Reference: 0.5)

after incubation, whereas similar cultures exposed up to 120 minutes showed growth only in the form of a few separate large colonies.

Of the original 25 strains of red halophiles, 20 grew on skim-milk agars containing 27 percent salt, 2 grew on agar containing 24 percent salt, and 3 grew on agar containing 21 percent salt. After becoming adapted, all strains grew on agars at salt concentrations of 27 percent. Only 6 of the original strains grew on agars at salt concentrations as low as 12 percent; whereas, after becoming adapted, 24 strains grew at this concentration and 5 strains grew at salt concentrations as low as 6 percent. Replacements of the sodium ion by potassium, lithium, magnesium, calcium, or barium inhibited growth of halophilic strains at each of the concentrations tested. In contrast, facultative halophilic bacteria were able to grow on all but the barium chloride agars at the lower concentrations. With the facultative halophiles, the inhibitory effect of cations was such that they could be arranged in a Hofmeister series.

Twenty-six references are cited.

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the falling-rate periods.

4.13 PRESENCE OF THREONINE-CONTAINING PHOSPHOLIPID IN TUNNY MUSCLE

Igarashi, Hisanao; Zama, Koichi; and Katada, Muneo (Hokkaido University, Hakodate, Japan)
Nature 181, 1282-1283 (May 3, 1958)

Introduction. --It previously has been observed by many workers that the phospholipid fractions from several animal tissues contain unidentified bases in addition to choline, ethanolamine, or serine. We have found threonine in the hydrolysate of the so-called cephalin fraction, obtained from the muscle of a tunny, Thynnus orientalis. From this fraction we prepared dinitrophenyl derivatives, from which a small amount of a phospholipid containing dinitrophenylthreonine was obtained, besides considerable quantities of lipids containing dinitrophenylserine and dinitrophenylethanolamine, by means of chromatographic separation on a silicic acid 'Celite' column. These substances have been identified by chromatographic methods, periodate oxidation, and analytical results.

Experimental. --Five kgm. of tunny muscle was minced and extracted successively with acetone, ethanol and petroleum ether. From these extracts, a phospholipid fraction that was soluble in petroleum ether but insoluble in acetone and ethanol was collected. This fraction was repeatedly fractionated by Folch's procedure to yield a phosphomonoaminolipid fraction that was free from inositol-containing lipids and mineral bases; yield 2.98 gm., phosphorus 4.08%, nitrogen 1.81%, iodine number 33.6. The fraction consumed no periodate. From the hydrolysate of the lipid, ethanolamine, serine, and threonine were identified by paper chromatography, but no free nitrogeneous bases were detected on a chromatogram of the lipid itself. To 2.40 gm. of the lipid dissolved in 35 ml. of chloroform, 25 ml. of a 7-percent ethanolic solution of 2,4-dinitrofluorobenzene, and 25 ml. of a 4-percent aqueous sodium carbonate were added. After this mixture had been shaken for 20 hrs. at room temperature, the chloroform layer was removed. The residual aqueous layer, after being acidified with hydrochloric acid, was extracted with 10 ml. of chloroform.

The chloroform solutions were combined and evaporated. The dinitrophenyl derivatives were dissolved in 3 ml. of chloroform, then chromatographed on a silicic acid/'Celite' (2:1) column (2.7 cm.

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6.30 THE DRYING OF SEAWEEDS AND OTHER PLANTS. I. THROUGH-CIRCULATION DRYING OF ASCOPHYLLUM NODOSUM

Merritt, J. H. and Cosgrove, E. T. (Atlantic Regional Laboratory, National Research Council, Halifax, Nova Scotia)
Journal of the Science of Food and Agriculture 9, 300-308 (May 1958)

Through-circulation drying of the seaweed Ascophyllum nodosum was carried out on a commercial scale in a batch dryer to determine the optimum conditions for drying.

Dryer construction. --A batch-type dryer was constructed of insulated ½-inch plywood lined with sheet aluminum and having the following overall dimensions: 15 feet long, 5 feet wide, and 11 feet high. The drying chamber in this batch dryer was 2 feet wide by 4 feet deep by 4 feet high. Two 24-inch by 24-inch expanded aluminum trays were placed on tracks made of aluminum angle iron at each of 5 levels spaced 10 inches apart in the drying chamber. These 10 trays had a total capacity of about 500 pounds of wet seaweed. Air for drying was warmed by means of steam-heated fin coils and controlled by a modulating type controller and a motorized valve in the steam supply line.

Air was circulated by a fan with a rated capacity of 4800 cubic feet per minute at 200° F. against a static pressure of 5 inches of water. Manually operated ducts and dampers were used to control air recirculation and to determine the path of the air flow. Room air was taken into the dryer at the inlet and exhausted to the outdoors.

Loading procedure. --A weighed amount of wet seaweed that contained 80 percent moisture was distributed evenly over each tray. At the end of the drying operation, the dried weed was weighed and ground and its average moisture was determined in a moisture balance. At intervals during

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 ABSTRACTER: Martin Heerdt

6.190 FEEDING TRIALS WITH SKIM MILK, MEAT MEAL, FISH MEAL, AND SOYBEAN OIL MEAL FOR BACON PIGS

Hellberg, A.; Dahl, O.; and Appelgren, K. I. (Ultuna, Uppsala 7, Sweden)
National Animal Experiment Station, Royal Agricultural College Bulletin No. 62, 26 pp. (1956) (In Swedish, English summary p. 24-25)

Purpose. --Two studies were made to learn about (1) the effect of fish meal upon the quality of pork and (2) the possibility of substituting fish meal for other protein feeds.

Study one. --Study one was made with 384 pigs divided into 8 series of 6 groups of 8 pigs. The respective protein supplements to the diets fed to these 6 groups of pigs were as follows: group 1 (controls), skim milk; group 2, meat meal; group 3, cod meal that contained 5.2 percent fat. These were fed until the pigs reached a live weight of 50 kilograms and then soybean oil meal was fed to maturity. Group 4 was fed the same diet that was fed to group 3 except that cod meal was fed to a live weight of 60 kilograms before the pigs were switched to soybean oil meal; group 5 was fed herring meal that contained 12 percent fat until the pigs reached a live weight of 50 kilograms and then soybean oil meal was fed to maturity; group 6 was fed the same diet that was fed to group 5 except that herring meal was fed to a live weight of 60 kilograms before the pigs were switched to soybean oil meal.

The rate of growth and the utilization of feed during the total period for groups 2 to 6 were in the range 660 to 685 grams increase in weight per day and 3.2 to 3.34 feed units consumed per kilogram of increase in weight. The control group by comparison gained at the rate of 715 grams per day and consumed feed at the rate of 3.10 units per kilogram increase in weight. During the time that the pigs were in the weight range 30 to 50 kilograms, the rate of growth and the utilization of feed were almost

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 ABSTRACTER: Martin Heerdt

6.55 INVESTIGATIONS CONCERNING PRESERVATION OF FISH PRODUCTS FOR FEEDING

Olsson, Nils and Olofsson, N. Edvin (Ultuna, Uppsala 7, Sweden)
National Animal Experiment Station, Royal Agricultural College Bulletin No. 59, 38 pp. (1955) (In Swedish, English summary p. 37)

Purpose. -- This study was made to determine optimum conditions for the wet preservation of fish with formic acid and molasses. Wet preserved fish was also used in feeding trials with chicks and with growing pigs. Fish meal prepared by drying raw material from the same source that was used in making wet preserved fish was fed for comparative purposes.

Results. --Fish ensilage with good keeping qualities was obtained by the use of 1.5 liters of formic acid or by the use of 20 kilograms of molasses per 100 kilograms of finished ensilage. In chick feeding studies based on meal and ensilage that contained equal amounts of dry matter, fish meal produced slightly better growth than was obtained with fish ensilage. These findings were based on fish ensilage prepared with AIV-liquid, formic acid, or molasses. The health and general well being of these chicks was not influenced unfavorably by feeding fish ensilage. Growing pigs that received fish meal gained 23 to 28 grams more weight per pig daily than did growing pigs that received fish ensilage, which contained as much dry matter as the fish meal. On the basis of a 25-percent loss in slaughter, pigs that received fish meal consumed 3.32 feed units per kilogram increase in weight, whereas pigs that received fish ensilage consumed 3.47 feed units per kilogram increase in weight.

Pigs that received fish meal and fish ensilage had a slightly looser back fat on the basis of the iodine value of the fat than did pigs that received skim milk. Doubt was expressed as to the possible

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 ABSTRACTER: Martin Heerdt

THREONINE PHOSPHOLIPID IN TUNA

FEEDING FISH MEAL TO PIGS

DEHYDRATION OF SEAWEED

PREPARATION OF FISH ENSILAGE

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equal in the groups that received skim milk and fish meals; whereas the group that received meat meal showed a somewhat lower rate of growth and utilization of feed. During the time that the pigs were in the weight range 60 to 80 kilograms, meat meal, however, produced somewhat better results than did soybean oil meal.

An inverse relationship was found between the quality of the pork and the total amount of oil in the fish meal added to the diet. More than half of the samples of flesh obtained from pigs in group 6 had an off-flavor. The quality of pork obtained from pigs that received meat meal was only slightly below the quality of pork obtained from pigs that had received skim milk. Peroxide values showed this difference better than did thiobarbituric acid color values.

Study two. -- Part two of the study was made using 144 pigs divided into 3 series of 6 groups of 8 pigs per group. The respective protein supplements of these 6 groups of pigs were as follows: group 1 (controls), skim milk; group 2, a mixture of meat meal, soybean oil meal, and grape-seed oil meal; group 3, 2 percent cod meal fed until the pigs reached a live weight of 40 kilograms in addition to the same protein feed that was received by group 2; group 4, 2 percent cod meal was fed throughout the entire trial period in addition to the same protein feed that was received by group 2; group 5, 3 percent cod meal fed until the pigs reached a live weight of 40 kilograms in addition to the same protein feed that was received by group 2; and group 6, 3 percent cod meal fed throughout the entire feeding period in addition to the same protein meal that was received by group 2. Group 2 received a protein feed that was composed of 50 percent meat meal, 42 percent soybean oil meal, and 7.5 percent grape-seed oil meal.

In study two, the rate of growth and the utilization of feed were practically the same for groups 2 to 6 and nearly as good as the results obtained with the control group. The rations received by groups 4 and 6 appeared to be slightly superior to the rations received by groups 2, 3, and 5 throughout the weight range 55 to 75 kilograms. Pigs in study two showed smaller differences in pork quality than pigs in study one. Pork obtained from pigs in groups 1, 2, and 3 was very similar. Groups 4 and 5 produced pork that was similar but somewhat inferior to pork obtained from groups 1, 2, and 3. Group 6 produced pork that was slightly inferior in quality to the pork produced by groups 4 and 5.

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presence of a fishy flavor in the flesh of pigs that had received fish meal. The dry fish meal was easier to prepare and more advantageous for use in feeding chickens and pigs than the wet fish ensilage. Fish meal also was in a more suitable form for storing, transporting, marketing, and mixing with other feeds than the wet fish ensilage. If fish are obtained in small quantity and at a considerable distance from a fish meal plant so that the cost of transportation becomes excessive, the preparation of fish ensilage may then be preferable to the preparation of dry fish meal.

4.13

by 20 cm.). From band 1, eluted with chloroform/methanol (98:2), dinitrophenylethanolamine was isolated and identified after hydrolysis. From band 2 eluted with chloroform/methanol (9:1), 1.28 gm. of a yellow derivative was obtained. Dinitrophenylserine and dinitrophenylthreonine were found on a paper chromatogram of the hydrolysate of this material. Then this fraction was again allowed to pass through a silicic acid/celite (2:1) column (1.5 cm. by 20 cm.), eluting with a mixture of chloroform and methanol (1:1), to yield 0.825 gm. of band 2a and 0.210 gm. of band 2b. The band 2a (0.810 gm.) was refluxed with 25 ml. of 6 N hydrochloric acid and 25 ml. of ligroin for 20 hr. After hydrolysis, the acid layer was twice extracted with 15 ml. of ligroin to remove the fatty acids, evaporated in vacuo to dryness and finally dried in a desiccator over sodium hydroxide. The residue was stirred with a small amount of water and the solution was extracted with ethyl acetate. The extract was chromatographed on a silicic acid/'Celite' (2:1) column, eluted with acetic acid/ethyl acetate/ligroin (1:1:8); 7 mgm. of dinitroaniline and 125 mgm. of dinitrophenylserine were isolated and identified. Material in band 2b was hydrolyzed in the same manner as described above. Chromatographic separation of the dinitrophenylamino-acids gave 5 mgm. of dinitroaniline, 8 mgm. of dinitrophenylserine, and 26 mgm. of dinitrophenylthreonine (m.p. 149 to 52° C.), which assayed 41.99 percent carbon, 3.70 percent hydrogen, and 14.62 percent nitrogen as compared with a calculated composition of 42.11 percent carbon, 3.88 percent hydrogen, and 14.73 percent nitrogen.

Hydrolysis of these dinitrophenyl-amino-acids by the method of Lowther yielded the corresponding free amino-acids. From the products of periodate oxidation of the threonine, acetaldehyde and glyoxylic acid were identified.

The ligroin solutions obtained in the hydrolysis of the band 2b were combined, washed, dried with ethanolic potassium hydroxide, extracted with ethyl ether to remove unsaponifiable materials, then acidified with hydrochloric acid and extracted with ethyl ether. The ether solution was evaporated to dryness: 0.081 gm. of mixed fatty acids with a neutralization number 209.7 and iodine number 45.6 were isolated. The presence of palmitic and oleic acids was detected on the paper chromatograms of their 2,4-dinitrophenylhydrazides and mercuric-acetate complexes.

Results. -- From the results thus obtained, it may safely be stated that a phospholipid containing threonine is present in the lipid from tunny muscle. It may also be presumed that this lipid has a structure of palmitoyl-oleoyl-glyceryl-phosphoryl-threonine.

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the run, samples enclosed in 3/8-inch mesh fish-net bags were withdrawn from the trays by means of ports in the door; and the moisture content of the seaweed in the top, middle, and bottom layer was determined. The dry-bulb temperature of the exit air proved to be a good measure of the state of dryness of the seaweed, and this measure was used for terminating test runs.

Results. --Preliminary tests indicated that loading and air mass flow were largely independent of other variables. Tests were made, therefore, to evaluate the effects of varying (1) bed thickness and number of layers and (2) air flow. Bed-thickness studies indicated that increased output could be obtained by increasing the bed thickness within limits. More than 1.5 pounds bone-dry solids per square foot per layer resulted in nonuniform drying owing to compression of the weed because of its own weight. For evenness of drying, high velocity air was beneficial even toward the end of the run.

At all four of the temperatures studied: 160°, 180°, 200°, and 220° F., the dryer was approximately 83 percent as efficient as an ideal dryer. Heat loss was due mainly to inefficiency of the steam heater and to loss through the walls of the dryer. A feasible maximum loading of rockweed having an initial moisture content of 80 percent was about 8 pounds per square foot in each layer. Four layers at this rate of loading were enough to insure full use of the drying air with air mass flow at the rate of 20 pounds of dry air per minute per square foot. Choice of control temperature and extent of recirculation had a more significant effect on the resultant output than on the efficiency of drying. Heat consumption that varied from 375,000 B.t.u. to 500,000 B.t.u. resulted in drying times that varied from 280 minutes to 69 minutes.

6.72 STRUCTURE OF SPERM- AND SEI-WHALE INSULINS AND THEIR BREAKDOWN BY WHALE PEPSIN

Ishihara, Yoshio; Saito, Tsuneyki; Ito, Yasuzo; and Fujino, Masahiko (Hokkaido University, Hakodate, Japan)
Nature 181, 1468-1469 (May 24, 1958)

The authors' experimental results with the method of Moore and Stein (1951) for the identification of amino acids showed that the amino acid composition of insulin from sei whales differed somewhat from that reported by Harris, Sanger, and Naughton (1956). The authors recently re-examined the amino acid analyses of insulin from sperm and sei whales, including whole insulin, glycyl chains of oxidized insulin, and phenylalanyl chains of oxidized insulin from both species of whale. These studies confirmed that the amino acid content of sperm insulin is similar to that obtained by Harris et al. (1956); but the results of the investigation indicate that sei-whale insulin contains an alanine instead of an isoleucine residue in the glycyl chain.

Present studies. -- Amino acid sequences in insulins from both sperm and sei whales were compared with the sequences reported by Harris et al. (1956). The phenylalanyl chains were found to have the same sequence as those reported by these authors, but the species differed in positions 8, 9, and 10 of the glycyl chain. For example, in sperm-whale insulin, the threonine, valine, and isoleucine sequence was identical with the sequence reported by them; whereas in sei-whale insulin, the sequence appeared as alanine, serine, and threonine.

Experimental. -- Crystalline insulins from sperm and sei-whale and crystalline pepsin from the sei whale were recrystallized four and seven times, respectively. A sample of crystalline swine-pepsin also was recrystallized four times and was used in the preparation of a glycerol solution that

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ABSTRACTER: Martin Heerdt

7.522 QUANTITATIVE DETERMINATION OF AMINO ACIDS BY THE METHOD OF DISTRIBUTIVE PAPER CHROMATOGRAPHY

Denisova, A. A. (Central Research Institute of the Leather Industry, Moscow, U.S.S.R.)
Biochemistry (U.S.S.R.) (Translated by the Consultants Bureau, Inc., New York, N. Y.) 22, No. 4, 708-714 (July-August 1957)

The methods presently used for the quantitative determination of amino acids that have been separated by distributive paper chromatography involve elution of the amino acids from the spots and determination of the content of amino acid in the eluate. Several different techniques have been used for the determination of amino acids. The simplest method, however, is one based on direct photometric measurement of amino acid spots.

Experimental. -- The quantitative determination of amino acids in the hydrolyzate of a protein of unknown composition is based upon a comparison of the hydrolyzate of the protein under study with a model mixture of pure amino acids. The model mixture is made to correspond both qualitatively and quantitatively to the expected composition of the hydrolyzate of the protein studied.

Because the photometric measurement of the intensity requires the spots to be in a straight line, one-dimensional chromatography is necessary. A descending column with Whatman 3MM paper is used. Both the hydrolyzate and the model mixture are spotted on strips of paper as lines 1.5 centimeters long and with 2.0 centimeter spaces between lines.

Clearer separation of amino acids with lower Rf values is obtained from drops that contain 0.0472 µg dry amino acids; with higher Rf values (as of valine, methionine, phenylalanine, and leucine), the content of dry substance must be doubled. The amino acid is placed on the paper by a

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ABSTRACTER: Kathryn L. Osterhaug

7.53 FISH MEAL--ANALYSIS

Montequi, D. and Garcia Pineda, M. D.
Boletin del Instituto Espanol de Oceanografia No. 79, p. 79 (June 1956)
World Fisheries Abstracts 9, 39-40 (March-April 1958)

The many factors that render difficult the determination of fat in fish meal may be due to the heterogeneous nature of the product, difficulties in obtaining a total extraction and completely drying it.

To review the different methods used, the following experiments were made:

Experiment 1. --Dolphin meat was used and the fat extracted with ethyl ether using the Soxhlet. About 6.47 and 6.41% of fat were obtained using duplicate samples. With the Twiselbaum method, the results were 6.44 and 6.49%. The same sample was examined by Stansby's method, consisting of 2 essential modifications: the replacement of ethyl ether by acetone in the first experiment and by acetone with 1% HCl in the second. When using only acetone, 11.93% of fat was obtained. A similar percentage was obtained in the second case. It is necessary to keep in mind that, in order to extract the fat, the meal was previously dried at 118° C. (244° F.).

Experiment 2. -- Three types of analysis were made: (1) 4 to 5 g. of the following fish meals were dried at 125 to 130° C. (257° to 266° F.) and extracted with ethyl ether in a Twiselbaum extractor for 6 to 8 hrs. The following results were obtained: meal from bonito scrap, 7.59%; meal from bonito heads, 4.2%; anchovy meal, 6.01%; whole meal from anchovy, 11.37%; (2) the same process as in (1) was used but ethyl ether was replaced by anhydrous acetone. The following figures were obtained: 8.43, 4.8, 7.87 and 22.75%, resp., for the above samples; (3) two 8- to 15-g. samples were extracted with boiling acetone. The percentage for one of the samples coincided with the one

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ABSTRACTER: Francisco Hoyos

7.80 BIOCHEMICAL PROCESSES ON THE DECOMPOSITION OF HAKE

Varela, G. and Wojciech, R.
Anales de Bromatologia 8, No. 1, p. 5 (1956) (In Spanish)
World Fisheries Abstracts 9, 45-46 (March-April 1958)

In this work, the variation of pH, trimethylamine (TMA), dimethylamine (DMA), tyrosine number, mercuric chloride and iodometric tests in hake (Merluccius merluccius) flesh kept in a domestic refrigerator in closed as well as in open containers have been studied. The samples (500 to 750 g. pieces) were from the market in Madrid, Spain, and had the following average composition: dry matter, 18.3% with 91.13% of proteins, 6.81% of ash and 1.56% of fat.

Confirming the earlier work on this subject (80 refs.), the unreliability of these determinations as indices of spoilage of fish which is connected with several chemical, physical, and microbiological causes, is pointed out. pH, determined with Merck litmus paper, fluctuates between 6.4 (fresh flesh) and 7.5 (spoiled flesh), and although acidity decreases with the spoilage there is not a direct correlation.

For fresh fish, the maximum of TMA is 15 mg. of N/100 g. of flesh. In fresh hake, the values are lower than 10 mg. (frequently less than 5 mg.) and for definitely spoiled flesh is 19 to 48 mg. of N. The Dyer picrate method was used in the analysis. Test tubes with ground stopper are used to get a hermetic seal to prepare the control solutions with concentrations of 0.01 and 0.04 mg. of trimethylamine N per tube, i.e., amounts bigger than usual.

The evaluation of DMA were made according to the technique used by Dyer and Mounsey (1945); the maximum values found were 0.2 (fresh fish) and 1.5 (spoiled fish) mg. of N/100 g. of fish. The

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ABSTRACTER: F. Lopez-Capont

STRUCTURE OF WHALE INSULINS

DISTRIBUTIVE PAPER CHROMATOGRAPHY

LIPIDS IN FISH MEAL

CHEMISTRY OF DECOMPOSITION

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microanalytical pipette.

The hydrolyzate and model mixture are developed by the use of appropriate solvents and then are treated with ninhydrin. The developed chromatograms are dried at room temperature in a hood that contains filters for cleaning the air. The dried chromatograms are photographed, and photometric measurements are made.

Theoretically, it is possible to measure either the chromatogram directly or its diapositive. If the spots themselves are to be measured photometrically, the chromatogram must be made transparent. Because no completely satisfactory method has been found to accomplish this, it is recommended that the diapositives be measured photometrically.

The chromatogram is photographed in transmitted light because more reproducible results are obtained from its use than from the use of reflected light. So that uniform light and standardized conditions may be obtained, a wooden box measuring 50 by 30 by 20 centimeters and lined with nonferrous tin is used. On the bottom of the box are fastened six electric lamps of daylight color, and two frosted glass plates cover the top of the box.

The chromatogram to be photographed is placed on top of the glass plates; the edges are covered with black paper and are pressed down with ordinary window glass. During photographing, the width of the spots must always correspond to the width of the lighted slit of the microphotometer. The diapositives made from the negatives of the chromatograms are measured photometrically on a self-recording Moll microphotometer.

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increase of this N compound may be an acceptable index to follow the spoilage of hake but the numerical values are too low and may lead to error.

The tyrosine number was determined according to the technique used by Petronici, based on the color reaction of Folin and Ciocalteau. The figures obtained fluctuated between 5.3 and 18 mg./100 g. of fresh hake. It is interesting to note the relation between the tyrosine and the TMA. When more than 15 mg. of the former were found (maximum figure for freshness) the latter was in amounts of over 25 mg.

The mercuric chloride freshness test for hake can be considered according to Amano (see WFA, March/April 1952, p. 45, under the subject headings FWS 7.81, Food Examination, Freshness Tests-Chemical, 614.31) as of qualitative but not quantitative value.

The iodometric test was made according to the method invented by Truttwin and, in accordance with this author, in spoiled fish, values over 12 (in ml. of a 0.08% iodine solution) were found. The grade of grinding of the sample has great influence on the determination of the number, as values twice as large can be obtained when the sample is either machine- or mortar-ground.

The shape and conditions of the container with the sample, which is kept in the refrigerator, have an influence on the biochemical transformations, especially on the organoleptic characteristics.

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contained 10 micrograms of pepsin per milliliter (ml.) of solution. Oxidation and fractionation of insulin and the partial hydrolysis of each fraction with both of the pepsins or with hydrochloric acid were carried out under the conditions described by Harris, Sanger, and Naughton. The hydrolysates obtained were fractionated (1) by paper ionophoresis at pH 3.2 or pH 6.5 by using pyridine-acetate buffer and (2) by paper chromatography with phenol-ammonia and with n-butanol-acetic acid solvent mixtures. Peptides were eluted, these eluates were hydrolyzed with 6 N hydrochloric acid, and their constituent amino acids were identified by paper chromatography. A comparison of the amino acid composition of these peptides and the sequence of amino acids in the glycyl and phenylalanyl chains of oxidized beef insulin showed the possibility of assigning positions to each amino acid.

Results.--Sei-whale insulin differs from sperm-whale insulin in that an isoleucine residue is replaced by an alanine residue; and the three residues in positions 8, 9, and 10 of the glycyl chain are alanine, serine, and threonine, respectively.

Whale pepsin was found to have a specificity somewhat different from that of swine pepsin. Whale pepsin specifically attacks many, but not all, of the peptide bonds in which valine is the amino partner and leucine is the carboxyl partner. Whale pepsin also attacks both sides of a serine residue except positions 12 and 13 in the glycyl chains of oxidized sei-whale insulin.

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obtained in the second test, but the other was too low.

Experiment 3.--Bonito scrap and anchovy meals were used and analyzed using the A.O.A.C. method. The total amount of fat extracted was 17.9% and 18.03%, resp.

Discussion.--In Experiment 1, the samples were dried before the extraction with solvents. When comparing with the results obtained in experiment 2, the superiority of acetone over ethyl ether is noticeable. The use of the A.O.A.C. method gave results higher than the rest of the procedures used. According to Stansby, the most complete extraction of the fat is due to the hydrolytic action of the water favoring the extraction of lipid substances.

In the U.S.A., investigators are working to solve the problem of the determination of fat in fish meals. The most difficult point is the great variations with the ageing of the product. Stansby suggests that when a meal gets old, the free fat is bound and forms a molecular compound that resists dissolution. This bonding action would increase with the unsaturation of the fat.

7.89 BASIC PRINCIPLES AND INSTRUMENTATION PART 2. KINESTHETICS--TEXTURE

Kramer, Amihud and Twigg, Bernard A. (University of Maryland)
Canner and Freezer 126, 14-15, 16-17 (May 12, 1958)

Cutting type tenderometers. --The National Canners Association developed the fibrometer specifically for identifying fibrous asparagus stalks. The fibrometer consists of a channel shaped to contain an asparagus stalk. A 0.035-inch diameter wire on a three-pound weight is allowed to cut the asparagus at increments along the stalk. Any segment of the stalk which the wire does not cut through is considered fibrous.

The fiber-pressure tester was designed to make the fibrometer principle more versatile, so that corrections could be made for differences in stalk diameter, and for use on raw as well as processed products.

Shear-pressure. -- Tenderometer-type tests are actually combinations of compressing and shearing forces. These tests simulate the action of the teeth, which first compress, and then shear or cut the food that is being chewed. A recording strain gage denture tenderometer where the test cell actually consists of a set of plastic dentures has been developed.

A general purpose instrument. --A multi-purpose instrument using three different test cell assemblies and gauges of different ranges has been developed. This instrument is called the shear-press.

The basic unit consists of a hydraulic drive system for moving a piston at any predetermined

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 ABSTRACTER: Richard W. Nelson

8.81 VOLATILE AMINES OF HERRING FLESH

Hughes, R. B. (Torry Research Station, Aberdeen, Scotland)
Nature 181, 1281-1282 (May 3, 1958)

Gas chromatography affords a rapid method for the specific identification and estimation of the volatile amines that are produced in fish flesh. In the experiments to be described, amines were quantitatively extracted from the flesh of herring (Clupea harengus) with aqueous 10-percent trichloracetic acid solution and steam-distilled at pH 10 into an excess of dilute hydrochloric acid solution. The distillate was concentrated under reduced pressure, and finally freeze-dried. The resulting residue of amine hydrochlorides was dissolved in a suitable volume of water and applied to the gas chromatography column in the manner described by James, Martin, and Howard-Smith (1952).

Experimental. -- Absolutely fresh herring flesh (from fish taken alive from the drift net and frozen in solid carbon dioxide) contained ammonia (20 mgm./100 gm. flesh) and trimethylamine (1 mgm./100 gm.). No mono- or di-methylamine was present. No higher aliphatic amines were found under conditions that would have detected amines in the series ethylamine to butylamine had any of these been present in a concentration greater than 0.5 mgm./100 gm. flesh.

In order to follow changes occurring during the spoilage of un-iced whole fish, immature herring taken from the Moray Firth were allowed to spoil in a loosely closed aluminum fish-box at ambient temperature (10 to 12° C.) over a period of four days. Whole fish (less the head and gut) were analyzed at intervals of eight hours. Trimethylamine increased in the manner previously described for herring by Sigurdsson (1947), there being an initial slow production (10 mgm./100 gm. after 40 hr.) followed by a more rapid increase, with a final leveling off after 90 hr. at about 100 mgm./100 gm. During the same period ammonia increased from 15 mgm./100 gm. to 56 mgm./100 gm. and dimethylamine from nil to 8 mgm./100 gm. A very small quantity of monomethylamine

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8.64 B-COMPLEX VITAMINS IN CERTAIN BROWN AND RED ALGAE

Teeri, A. E. and Bieber, R. E. (University of New Hampshire, Durham)
Science 127, 1500 (June 27, 1958)

In this report are presented the results of an investigation of the B-vitamin content of certain red and brown algae.

Experimental. -- The plants analyzed were Fucus spiralis, Ascophyllum nodosum, Laminaria agardhi, and Chondrus crispus. They were taken from the coast line of New Hampshire and of York, Maine, through the months of October and November 1956. The algae were dried in a large, forced-hot-air dryer, at not over 85° C., and were then ground in a Wiley mill before analysis.

Analyses for the various vitamins were carried out by microbiological procedures; Lactobacillus arabinosus 17-5 (ATCC 8014) was used for niacin, pantothenic acid, and biotin, Lactobacillus casei (ATCC 7469), for riboflavin, Streptococcus fecalis (ATCC 8043), for folic acid; Lactobacillus fermenti 36 (ATCC 9833), for thiamine, and Lactobacillus leichmannii (ATCC 7830), for vitamin B_{12}.

Results. -- The average results of the vitamin-content analyses are presented in Table 1 (see over). The four algae gave rather high results for niacin content when compared to many vegetables, fruits, and animal feeds. However, even the species containing the greatest amount of niacin, Chondrus crispus, contains considerably less than the 60 or more micrograms per gram found in barley and wheat. It can be concluded that these algae are a moderately good source of niacin. While all four of the algae studied are rich sources of pantothenic acid, the red alga C. crispus contains much more of the vitamin than do the three brown algae. This same relationship holds also for riboflavin and, to a lesser extent, for thiamine and vitamin B_{12}, indicating perhaps that in general the red algae are superior to the brown as a source of B vitamins.

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9.7 PLANNING YOUR RESEARCH PAPER

Sanford, F. Bruce (Fishery Technological Laboratory, Seattle, Washington)
Fishery Leaflet No. 447, 33 pp. . (April 1958) U. S. Department of the Interior, Fish and Wildlife Service, Washington, D. C.

This manual, which is divided into two main sections, presents suggestions on how to plan your research paper. The first section deals with preliminary steps in planning--such as outlining, choosing headings, and making tables. The second section deals with the various parts of the research paper: title, abstract, table of contents, introduction, acknowledgment, procedure, results and discussion, conclusions, summary, and literature cited.

Stress is laid on the importance of keeping the paper in mind from the moment the research is conceived, of making adequate use of easily understood tables and illustrations, and of using outlines and headings. Particular attention is focused on the need for stating the specific problem and for orienting the reader to it. Suggestions are given on how to deal with problems in writing the procedure, the results and discussion, and the conclusion. The difference between the conclusion and the summary is made clear, and the relationship between the title and the specific objectives listed in the introduction is pointed out. Finally, a way of avoiding repetition in writing the summary and the abstract is suggested, the question is answered as to whom acknowledgment should be made, and necessary information is given on some of the more clerical aspects of the paper, such as the table of contents and the literature cited.

 ABSTRACTER: F. Bruce Sanford

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In addition to being a good source of niacin and pantothenic acid, the algae are apparently a relatively good source of riboflavin and folic acid and a fair source of biotin and vitamin B_{12}. They are comparable with many fruits and vegetables as a source of thiamine.

It may be concluded, therefore, that the algae constitute an important potential source of certain water-soluble vitamins for animal, or human consumption. Of the species studied, this is particularly true for the red alga Chrondrus crispus.

Table 1.--Average vitamin content (in micrograms per gram) of various species of algae. The average results were figured from three to seven determinations.

Vitamin	Fucus spiralis	Ascophyllum nodosum	Laminaria agardhi	Chondrus crispus
Niacin	22.8	14.6	30.2	31.8
Pantothenic acid	23.0	49.4	33.0	150.0
Biotin	0.063	0.021	0.042	0.032
Riboflavin	10.0	3.50	12.6	25.0
Folic acid	1.91	1.50	10.00	9.50
Thiamine	0.40	0.23	0.46	0.83
Vitamin B_{12}	0.080	0.096	0.052	0.312

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rate of travel. Automatic limiting pressure, and fast return of drive piston are provided. Measurement of force is provided by the compression of a proving ring dynamometer. The standard test cell consists of parallel stainless steel blades precisely meshed with the sample box.

Physical-chemical methods.--In the absence of adequate devices for measuring kinesthetic properties, quantitative, empirical, or physical-chemical procedures often are used successfully.

Moisture content.--It has been demonstrated that as vegetable crops approach maturity and become more chewy and therefore less desirable, they tend to accumulate solids, and thus percentagewise, lose moisture. Therefore, moisture determination was suggested as a measure of maturity, the characteristics of which are largely kinesthetic in nature.

The official AOAC method of moisture analysis usually calls for the use of a sample of given size spread over a given surface to be dried to a constant weight. Although the procedure is excellent from the standpoint of precision, it requires a drying time of six hours or more.

The Toluene and the Brown Duvel methods involve the distillation of the water from the samples, which are immersed in toluene or oil, respectively. The time requirement is reduced to less than one hour; however, a considerable amount of precision is lost.

Several moisture testers are available such as the Brabender and the Cenco, which give direct moisture contents for relatively dry products. However, most foods have high moisture contents. The Steinlite overcomes the problem of high moisture from a small sample with a relatively large quantity of solvent having low conductivity properties. The conductivity of the resultant mixture containing a relatively small quantity of water, is then measured electrically in the instrument.

Moisture content may also be determined by titration, using Karl Fischer reagent.

8.81

was formed, being first detected after 56 hrs. and increasing to 1 mgm./100 gm. after four days. No higher volatile amines were formed during the period.

In order to investigate changes taking place when herring flesh is heat-processed (as in canning), blocks of flesh were heated in sealed glass tubes for periods of 0 to 5 hrs. at 120°C. The cooked flesh and exuded liquor were combined for analysis.

Results.--Yields in terms of mgm./100 gm. of raw flesh averaged as follows: for ammonia 19 to 48, for trimethylamine 5 to 54, and for dimethylamine 0 to 26. A very small quantity of monomethylamine was also formed, not detectable until after two hours of heating, and reaching 1 mgm./100 gm. after five hours. No higher amines were formed.

Discussion.--The most remarkable feature of these results is the large amount of dimethylamine formed during cooking. Approximately 1 mole of dimethylamine is produced per 2 moles of trimethylamine. Trimethylamine oxide has long been known to be the precursor of trimethylamine in spoiling fish flesh, but the origin of dimethylamine is not certain. More recently, Vaisey (1956) has suggested a mechanism whereby dimethylamine can be formed from trimethylamine oxide by purely chemical means. He found that in aqueous solution at 22 to 24°C., trimethylamine oxide is rapidly reduced by reducing agents such as cysteine, haemoglobin, with ferrous ions catalyzing the reaction. Although trimethylamine is the main product, considerable quantities of dimethylamine, and some formaldehyde also are formed. Whether such reactions occur in spoiling fish flesh, perhaps catalyzed by bacterial enzymes, is still uncertain. In cooking flesh, however, it is almost certain that the breakdown of trimethylamine oxide follows some such course. Thus, Ronold and Jakobsen (1947) found that although trimethylamine oxide was completely stable when heated in glass vessels at 107°C. for several hours, the trimethylamine oxide content of homogenized herring fillet paste decreased under similar conditions. An increase in the formaldehyde content of herring during canning has been reported by Lunde and Mathiesen (1934).

Too little urea is present in herring flesh (2.8 mgm. nitrogen/100 gm.) to account for the production of ammonia (2 millimoles/100 gm.) during cooking. Nitrogenous substances such as creatine and histidine are rapidly degraded during cooking and may account for the production of ammonia.

0.321 A NEW CONTRACTILE PROTEIN OF SQUID MUSCLE A COMPARATIVE STUDY WITH CARP ACTOMYOSIN

Matsumoto, Juichiro J. (Tokai Regional Fisheries Research Laboratory)
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 2, 92-104 (1957) (In English)

To prove the assumption that the streaming birefringence observed in the aqueous extracts of squid muscle is due to the dissolving-out of actomyosin or an actomyosin-like protein, the streaming birefringent protein was separated as a concentrated solution by precipitating it through dialysis against 0.3 M KCl. Then the properties of the protein were compared experimentally with those of carp actomyosin.

0.321 THE EXTRACTABILITY OF THE MUSCLE PROTEINS OF MARINE ANIMALS

Migita, Masao and Matsumoto, Juichiro J. (Tokai Regional Fisheries Expt. Sta., Tokyo)
Nippon Suisan Gakkaishi 22, 561-8 (1956-57)
Chemical Abstracts 52, 8391 (May 25, 1958)

0.321 FISH MEAT AS RAW MATERIAL I. SOLUBILITY OF VARIOUS FISH MEATS IN DIFFERENT CONCENTRATIONS OF SODIUM CHLORIDE SOLUTIONS

Oba, Y.; Shiraishi, T.; and Inamasu, Y.
J. Shimonoseki Coll. Fisheries 4, 25-8 (1955)
Chemical Abstracts 52, 8409 (May 25, 1958)

The protein N of fresh fish was more sol. in 1.5 to 2N NaCl solns. than in solns. of higher or lower concn. irrespective of species of fish or season.

0.5 STUDIES IN THE BACTERIOLOGICAL CHEMISTRY OF SHARK MUSCLE SPOILAGE III. ON THE EFFECTS OF pH UPON THE ABILITIES OF THE UREA-SPLITTING BACTERIA ISOLATED FROM SPOILING SHARK MUSCLE

Kimura, Takahisa (Hokkaido University, Hakodate, Japan)
Bulletin of the Faculty of Fisheries, Hokkaido University 8, No. 2, 159-162 (August 1957) (English abstract and figures)

The author observed the effect of pH upon the ability of strain K-10 to decompose urea.

0.5 STUDIES IN THE BACTERIOLOGICAL CHEMISTRY OF SHARK MUSCLE SPOILAGE IV. ON THE EFFECTS OF TEMPERATURE UPON THE UREA DECOMPOSING ABILITY OF THE UREA-SPLITTING BACTERIA ISOLATED FROM SPOILING SHARK MUSCLE

Kimura, Takahisa
Bulletin of the Faculty of Fisheries Hokkaido University 8, No. 4, 310-313 (February 1958) (English abstract and figures)

2.115 DUTCH DESIGNS OF SMALL STEEL FISHING CRAFT

Anonymous
World Fishing 6, 36-38 (February 1957)

2.115 HOW HULL SHAPE AFFECTS FISHING BOAT SPEED

Anonymous
National Fisherman 38, 11-12, 39 (February 1957)

2.116 THE EFFECT OF WIRELESS TELEPHONE ON SARDINE PURSE SEINE FISHERY

Inoue, Makoto
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 1, 6-8 (1957) (English synopsis and tables)

Katagai and Ohara fleets doubled their fishing ability by using wireless telephone for exchanging fishing information among them.

3.230 PROGRESS IN FOOD SCIENCE BY THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Anonymous
Food Manufacture 31, 179-181 (May 1, 1956)

(Abstract of this article appears under 0.6 page 1 - January 1957)

3.231 PRODUCING FROZEN FISH

Anonymous
Food Manufacture 33, 44 (January 1, 1958)

British patent number 781,620 describes a method of producing portions of frozen fish having uniform weight and size by confining pieces of fresh fish in a mold between walls parallel to the length of the fish fibers. In this mold the pieces of fresh fish are subjected to sufficient pressure (0.5 kilograms per cubic centimeter) to cause reshaping of the pieces to the cross sectional shape of the mold. A press block is produced, frozen, and divided along planes at right angles to the direction of pressing. To cause the pieces of fresh fish to stick together in the mold they may be coated with an ideal cohesive agent such as a solution of actomyosin.

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
		Clupea pallasii (Pacific)
Thread		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
Rock		Cancer irroratus (New England)
		Cancer species (California)
Stone		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and Xiphopeneus kroyeri Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
	Little neck	Paphia staminea (Pacific)
Hard	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
		Venus mortoni (Florida)
Ocean quahog		Cyprina islandica
Pismo		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
		Pecten aequisulcatus (Pacific)
Sea		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

3.4 COLLOIDAL PROPERTIES OF SMOKE AND THE ROLE OF ITS COMPONENTS IN THE PROCESS OF SMOKING

Ziemba, Zenon
Przemysl Spozywczy 11, 389-93 (1957)
Chemical Abstracts 52, 2295 (February 10, 1958)

Intensive pptn. of smoke particles on vertical surfaces of products being smoked requires fine dispersion of smoke obtainable by increasing the concn. of air and keeping the humidity low. Discoloration of smoked fish is not due to phenols but to resinous products in the smoke.

3.4 SMOKE BARREL COOKERY

Anonymous
Institutions 42, 41-43 (June 1958)

(Abstract of this article appears under 2.8 page 1 - September 1958)

3.4 FISH SAUSAGE

Shimizu, Wataru (to Kibun Shoten Ltd.)
Japan 4980 ('56) June 25.
Chemical Abstracts 52, 8479 (June 10, 1958)

800 g. of vegetable oil was added to 100 g. of egg yolk or 10 g. of soybean lecithin, the mixt. was emulsified, and the emulsion was added to 5 times its wt. of milled fish meat to give a superior fish sausage.

3.61 MICROWAVE ENERGY IN FREEZE-DRYING PROCEDURES

Copson, David A. and Decareau, Robert V. (Raytheon Manufacturing Company)
Food Research 22, 402-403 (July-August 1957)

Results of microwave freeze-drying show in figure 1. A two-thirds reduction of drying time for samples of beefsteak 2 x 0.75 x 0.75 in. (2 ounces) with the application of microwaves energy at 2450 mc. is indicated. This is to demonstrate the acceptance of microwave energy by the product and its conversion to heat of sublimation. The finished product compared favorably in color, taste, and texture with the conventionally freeze-dried meat and with the fresh material, but was somewhat drier in taste than the fresh product.

3.61 MICROWAVE SUBLIMATION OF FOODS

Copson, David A. (Food Laboratories Research Division, Raytheon Manufacturing Company, Waltham, Massachusetts)
Food Technology 12, 270-272 (June 1958)

4.15 FATTY ACIDS AND GLYCERIDES OF SHARK (PRISTIS) LIVER OIL

Kamath, G. G. and Magar, N. G. (Inst. Sci., Bombay)
J. Indian Chem. Soc., Ind. & News Ed. 19, 171-6 (1956)
Chemical Abstracts 52, 1651 (January 25, 1958)

The component fatty acids and glycerides of Pristis liver oil are reported.

4.15 FATTY ACIDS AND GLYCERIDES OF SHARK (GALEOCERDO RAYNERI) LIVER OIL

Kamath, G. G. and Magar, N. G. (Inst. Sci., Bombay)
J. Indian Chem. Soc., Ind. & News Ed. 19, 201-5 (1956)
Chemical Abstracts 52, 1651 (January 25, 1958)

4.29 PREPARATION OF MONO- AND DIGLYCERIDES FROM PEANUT OIL AND THEIR HALOGENATION

Mukkerjee, D. K.; Mitra, C. R.; and Saha, An N. (Univ. Calcutta)
J. Indian Chem. Soc., Ind. & News Ed. 20, 23-4 (1957)
Chemical Abstracts 52, 2429 (February 10, 1958)

Glycerolysis of peanut oil was carried out with K_2CO_3 as a catalyst. The resulting mono- and diglycerides contain OH groups which were replaced by Cl by passing dry HCl gas through the mixts. of the glycerides at 110°.

4.29 PYROLYSIS OF RINCINOLEATES

Wetroff, George; D'Ivacheff, Georges; and Khaladji, Jean (to Societe Organico)
U. S. 2,807,633 (Sept. 24, 1957)
Chemical Abstracts 52, 2431 (February 10, 1958)

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner and Freezer
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
FAO Fisheries Bulletin
Federation Proceedings
Feed Bag (supersedes Flour and Feed)
Feedstuffs
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Packer
Food Preservation Quarterly
Food Processing
Food Research
Food Science Abstracts
Food Technology
Frosted Food Field
Gourmet
Industrial and Engineering Chemistry
Industrial Refrigeration
Institutions
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Pan American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

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Editorial Clerk (Typist)--Gladys K. Chandler

4.89 ANTIBIOTIC ACTION OF FISH COMPONENTS

Toyomizu, Masamichi (Kyushu Univ., Fukuoka)
Nippon Suisan Gakkaishi 22, 368-73 (1956-57)
Chemical Abstracts 52, 8391 (May 25, 1958)

IX. Relation between the antibiotic action of the autooxidized shark liver oil and thiobarbituric acid value.

4.89 COSMETIC PREPARATIONS FROM SQUALENE OIL

Kawano, Suteko
Japan 5099 ('56) June 27.
Chemical Abstracts 52, 9532 (June 10, 1958)

Squalene in acetone is treated with alk. $KMnO_4$ soln. by stirring at <25° to give hydroxysqualene (I). I is treated with ethylene oxide at 110° to 40° with KOH as a catalyst. The ethylene oxide ether of I is reduced with H at 150° to 60° under pressure with Ni powder as a catalyst. The product is mixed with the usual cosmetic materials to give new cosmetics having a therapeutic effect on skin diseases.

5.111 ISOLATION OF VITAMIN Dm AND VITAMIN D_3 FROM THE IRRADIATION PRODUCTS OBTAINED FROM STEROLS OF THE MUSSEL, MODIOLUS DEMISSUS, DILLWYN

Petering, Harold G.
The Journal of Organic Chemistry 22, 808-811 (July 1957)

5.2 THIAMINE DEFICIENCY IN CATS

Anonymous
Nutrition Reviews 15, 190-191 (June 1957)

(Abstract of this article appears under 6.52 page 19 - November 1957)

5.4 THE NUTRITIVE VALUE OF MARINE PRODUCTS XVII. VALUE OF B-VITAMINS IN FISH FLESH FOR GROWTH OF YOUNG RATS

Beveridge, J. M. R.
Journal of the Fisheries Research Board of Canada 7, 74-87 (May 1947)

(Abstract of this article appears under 2.9 page 5 - July 1957)

6.15 A RAPID METHOD OF DETERMINING THE CONCENTRATION OF STICKWATER

Clifton, J. M. and Balaena, F. F.
Norsk-Hvalfangst-Tidende 44, No. 4, 205-207 (1955)

(Abstract of this article appears under 7.7 page 21 - January 1957)

6.15 SOLUBLE FEED FROM FISH

Yamazaki, Takuzo and Yamauchi, Katsumi
Japan 6071 ('56) July 23.
Chemical Abstracts 52, 9480 (June 10, 1958)

Fish are ground, incubated with Bacillus vulgaris or its culture in milk at 45° to pH 3.0, and then inoculated with Aspergillus niger and incubated at 45° for 96 hrs. to obtain a fish soluble.

6.237 MANUFACTURE OF VITAMIN A CONCENTRATE FROM FISH-LIVER OIL VII. ESTRIFICATION OF VITAMIN A CONCENTRATE 2. ACETYLATION WITH KETENE

Higashi, Hideo and Kinumaki, Toyosuke (Tokaiku Regional Fisheries Expt. Sta., Tokyo)
Nippon Suisan Gakkaishi 22, 500-3 (1956-57)
Chemical Abstracts 52, 8469 (May 25, 1958)

Acetylation of vitamin A concentrates from liver oils of various fishes was very simply preformed by passing ketene at room temp. through the soln.

6.237 PRODUCTION OF VITAMIN CONCENTRATES FROM BALTIC COD-LIVER OIL

Niewiadomski, Henryk and Drozdowski, Bronislaw
RocznikiTechnol. i Chem. Zywnosci 1, 99-115 (1957)
Chemical Abstracts 52, 8469 (May 25, 1958)

Vitamin concentrates from Baltic cod-liver oil were prepd. by sapon. and extn. of the unsaponifiable material, mol. distn., and extn. with selective solvents.

6.72 THE YIELD OF INSULIN FROM FISH

McCormick, N. A. and Noble, E. C.
Contributions to Canadian Biology 2, No. 7, 117-127 (1924)

(Abstract of this article appears under 8.51 page 13 - September 1958)

6.72 EXTRACTION OF CALCIUM SALT OF NUCLEIC ACID FROM SOFT ROE

Vercambre, Roland P.
Fr. 1,010,121 (June 9, 1952)
Chemical Abstracts 51, 13327 (September 10, 1957)

Powdered and stabilized roe, particularly of herring, are hydrolyzed with 5 percent aqueous NaOH for 30 min. at 75° to obtain the Na salt of nucleic acid and proteins.

6.72 UTILIZATION OF PYLORIC CAECA OF SKIPJACK I. PREPARATION OF HISTIDINE FROM THE PYLORIC CAECA EXTRACT

Kakimoto, Daiichi and Mizuma, Hiroshi (Kagoshima Univ.)
Nippon Suisan Gakkaishi 22, 316-19 (1956-57)
Chemical Abstracts 52, 8254 (May 25, 1958)

6.79 DETERMINATION OF MOISTURE, PROTEIN, FAT, ASH AND CHLORIDES IN HAKE ROE

Muriel Ledesma, M.
Anales de Bromatologia 8, No. 3, p. 313 (1956) (Madrid, Spain)
World Fisheries Abstracts 9, 27-28 (March-April 1958)

The average composition (%) of 12 samples on the basis of dry matter is moisture (in fresh roe) 72.80 ± 3.01; proteins, 63.75 ± 2.09; fat, 22.06 ± 3.78; ash, 6.49 ± 0.76; chlorides, 2.26 ± 0.32.

6.79 STUDY OF THE AEROBIC HETEROTROPHIC BACTERIA IN HAKE ROE

De Santiago Redel, E. and Lobillo Berlanga, E.
Anales de Bromatologia 8, No. 4, p. 479 (1956) (In Spanish)
World Fisheries Abstracts 9, 27-28 (March-April 1958)

This work is an advanced study of the 40 strains of bacteria in hake roe that is being studied. Up to the present, the following genera have been identified: Flavobacterium, Pseudomonas, Achromobacter, Micrococcus and Corynebacterium. The following microorganisms have also been identified: Achromobacter, liquefaciens, Micrococcus flavus, M. candidus, M. conglomeratus, Escherichia intermedium, and Aerobacter cloacae.

7.591 STUDIES ON CRYSTALLINE WHALE INSULIN I. ISOLATION AND CRYSTALLIZATION

Saito, Tsuneyuki; Ishihara, Yoshio; Ito, Yasuzo; and Fujino, Masahiko
Bulletin of the Faculty of Fisheries, Hokkaido University 7, No. 2, 159-164 (August 1956) (English synopsis, figures, and table)

Extraction with dilute acetone and then precipitation by zinc sulfate was found suitable for the preparation of crude whale insulin. For the crystallization of insulin, Scott's method was improved to give a good yield from the crude insulin preparation.

7.592 PIGMENT CHANGES IN PACKAGED BEEF DURING STORAGE

Pirko, Paul C. and Ayres, John C.
Food Technology 11, 461-468 (September 1957)

(Abstract of this article appears under 2.43 page 5 - January 1958)

7.593 MUSCLE OF AQUATIC ANIMALS. XXIV. THE DETERMINATION OF BETAINE NITROGEN

Shimizu, Wataru and Endo, Kinji (Kyoto Univ., Maizuru)
Nippon Suisangaku Kaishi 22, 413-16 (1956-57)
Chemical Abstracts 52, 9280 (June 10, 1958)

7.8 METHODOLOGY OF THE FLAVOR PROFILE

Sjöström, L. B.; Cairncross, S. E.; and Caul, J. F. (Arthur D. Little, Inc., Cambridge, Massachusetts)
Food Technology 11, 20-25 (September 1957)

The flavor profile method of analysis is a descriptive method that takes into consideration the total impressions of (1) the aroma and (2) the flavor-by-mouth of a product, as well as the independently recognizable aroma and flavor factors according to type, intensity, and order of perception.

7.8 THE CHARACTERISTIC ODOR OF SQUID (CUTTLEFISH) II. THE MOTHER SUBSTANCE AND SUPPRESSION OF THE ODOR OF BOILED SQUID

Yamanishi, Tei; Yamashita, Sachiko; Yamazaki, Akiko; and Tokue, Yoko (Ochanomizu Women's Coll., Tokyo)
Nippon Suisangaku Kaishi 22, 480-5 (1956-57)
Chemical Abstracts 52, 9471 (June 10, 1958)

7.8 THE CHARACTERISTIC ODOR OF SQUID (CUTTLEFISH) III. THE UNPLEASANT ODOROUS SUBSTANCE OF RAIN-SPOILT DRIED SQUID

Yamanishi, Tei and Miura, Kazuko (Ochanomizu Women's Coll., Tokyo)
Nippon Suisangaku Kaishi 22, 486-9 (1956-57)
Chemical Abstracts 52, 9471 (June 10, 1958)

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Vitamin Dm from mussel sterols	21	5.111
Vessels, fishing		
How hull shape affects speed	17	2.115
Design of steel fishing craft	17	2.115

7.80 PSYCHOPHYSICAL BIAS IN TASTE TESTING BY PAIR COMPARISON, WITH SPECIAL REFERENCE TO POSITION AND TEMPERATURE

Gridgeman, N. T. (Division of Applied Biology, National Research Council, Ottawa, Canada)
Food Research 23, 217-219 (March-April 1958)

Sensory pair comparison is exposed to psychophysical bias.

7.80 THE TETRAZOLIUM BROMIDE REDUCTION TEST IN ASSESSING THE QUALITY OF FISH

Kamasastri, P. V.
Current Sci. (India) 26, 214-15 (1957)
Chemical Abstracts 52, 7561 (May 10, 1958)

If fish passed organoleptic test, no color was preceptible until 3 hrs.; however, with spoiled fish, color was observed in 30 min.

7.80 THE DETERMINATION OF VOLATILE REDUCING SUBSTANCES AS AN AID IN THE OBJECTIVE ESTIMATION OF THE FRESHNESS OF SEAFISH

Wittfogel, H. and Gebhardt, R. (Vet. Untersuchungsamt Stade, Cuxhaven, Ger.)
Arch. Lebensmittelhyg. 8, 241-4 (1957)
Chemical Abstracts 52, 8410 (May 25, 1958)

Fish is sliced, pressed, and the liquid sepd. by centrifugation. Air is blown or sucked, first through the liquid to absorb any volatile reducing substances and then through a known amt. of standard $KMnO_4$ soln. The reduced $KMnO_4$ is detd. iodometrically with $Na_2S_2O_3$.

8.0 THE COMPOSITION OF FEEDING MEAT AND BONE MEAL

Pritchard, H. and Smith, Patricia A.
Journal of the Science of Food and Agriculture 8, 668-672 (November 1957)

Meat and bone meals contained significant amounts of the vitamin B-complex but a lesser amount than was reported for white fish meal and whale meal. If the lower protein content meat and bone meals were compared with white fish and whale meal on an equal protein basis, the vitamin B-complex content would be comparable. Vitamin B_{12} and choline increased with each increase in protein content.

8.0 CHEMICAL STUDIES ON HERRING MEAT

Sasa, Shigeo
Bulletin of the Faculty of Fisheries Hokkaido University 8, No. 4, 319-345 (February 1958) (In English)

Contains an outline of herring fishery in Japan, chemical composition of "spring herring," chemical composition of the "small herring," chemical composition of "oily herring" caught at various places, on the chemical compositions of the extractive of herring meat, inorganic components in herring meat and blood, changes of the amounts of volatile basic nitrogen and pH value during the storing of raw herring meat, chemical composition of the protein of herring meat, digestibility of herring meat, nutritive value of herring meat, and summary.

8.51 BIOCHEMICAL STUDIES ON THE FISH BLOOD VIII. ON THE ELECTROPHORETIC ANALYSIS OF SERUM PROTEINS

Saito, Kaname
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 12, 752-759 (1957) (English synopsis, table, and figures)

IX. On the paper electrophoretic analysis of serum proteins. --Ibid. 760-767.
X. On the seasonal variation of serum protein components of cultured fish. --Ibid. 768-772.
XI. On the serum protein components of the mature and immature stage of the marine elasmobranchs. --Ibid. 773-777.

8.51 CONCENTRATION OF THE EXTERNAL MEDIUM AND THE STATIONARY STATE OF NONPROTEIN AMINO ACIDS OF THE MUSCLES OF ERIOCHEIR SINENSIS

Duchâteau, Gh. and Florkin, M. (Univ. Liége, Belg.)
Arch. intern. physiol. et biochim. 63, 249-51 (1955)
Chemical Abstracts 52, 9451 (June 10, 1958)

The sum of the concn. of the 15 nonprotein amino acids in crab muscle is higher when the crab is maintained in salt water than in fresh water.

8.64 B-VITAMINS IN MARINE PRODUCTS AND THEIR CHANGES IN PROCESSING AND STORAGE. I. CANNED MACKEREL AND TUNA IN BRINE

Komata, Yasushi; Hashimoto, Yoshiro; and Mori, Takajiro (Univ. Tokyo)
Nippon Suisangaku Kaishi 21, 1236-40 (1955-56)
Chemical Abstracts 52, 4056 (March 10, 1958)

8.64 THE VITAMIN B GROUP (B_1, B_2, B_6, AND B_{12}) IN THE PYLORIC CAECA OF FISHES

Murayama, Shigeo and Tabei, Kikuko (Tokaiku Regional Fisheries Expt. Sta., Tokyo)
Nippon Suisangaku Kaishi 22, 136-41 (1956-57)
Chemical Abstracts 52, 4038 (March 10, 1958)

8.64 THE B-VITAMINS IN THE PYLORIC CAECA OF SKIPJACK I. THIAMINE, NICOTINIC ACID, FOLIC ACID, BIOTIN, AND PANTOTHENIC ACID

Kakimoto, Daiichi and Kanazawa, Akio (Kagoshima Univ.)
Nippon Suisan Gakkaishi 22, 574-6 (1956-57)
Chemical Abstracts 52, 7562 (May 10, 1958)

II. p-Aminobenzoic acid and riboflavine. --Ibid 577-82.
IV. Vitamin B_{12}. -- The vitamin B_{12} content in the pyloric caeca was 30 γ% (dry basis) by the Euglena method and 40 γ% by the Lactobacillus leichmannii method. Ibid. 634-6.

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